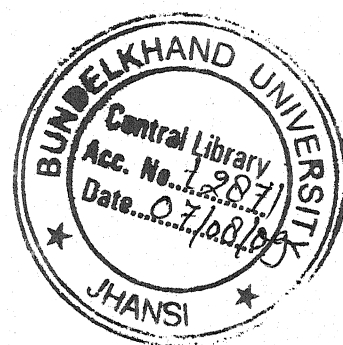# PREVALENCE OF OBESITY IN 6-17 YEARS OLD CHILDREN OF AFFLUENT SOCIETY IN JHANSI CITY

THESIS

Submitted to

Faculty of Home Science

Bundelkhand University, Jhansi

For

The Degree of

Doctor of Philosophy

Home Science

(Food & Nutrition)

by :

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CERTIFICATE

This is to certify that the work entitled **"Prevalence of obesity in 6-17 years old children of affluent society in Jhansi city"** is a piece of research work done by Ms. PREETI AGRAWAL under my supervision and guidance for the degree of **DOCTOR OF PHILOSOPHY** in Home Science (Food and Nutrition), Bundelkhand University, Jhansi (U.P.), India and that the candidate has put in an attendance of more than 200 days with me.
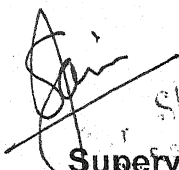
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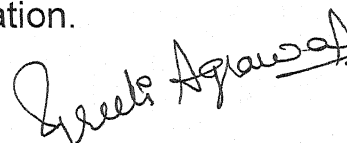
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DECLARATION

I hereby declare that the thesis entitled " **Prevalence of obesity in 6-17 years old children of affluent society in Jhansi city"** being submitted by me for the degree of Doctor of Philosophy in Home Science, Bundelkhand University, Jhansi (U.P.) is my own work conducted under the supervision of **Dr. Shailja Jain** Asstt. Professor, Deptt. of Home Science, Govt. K.R.G. Autonomous P.G. College, Gwalior and co-supervisor **Dr. Reetam Singh**, Lecturer, Deptt. of Home Science, Arya Kanya Degree College, Jhansi. Approved by research degree committee. I have put in more than 200 days of attendance with the supervisor at the center.

I further declare that to the best of my knowledge, the thesis does not contain any part of this thesis which has been submitted for the award of any degree either in the university or in any other university / deemed university without proper citation.

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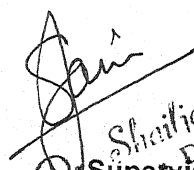Ms. Preeti Agarwal

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At this moment of glory and award I humbly accept that all credit accured actually goes to my parents Mrs. Kamala Agarwal and Prof. M.L. Agarwal, brothers Mr. Sunil Agrawal, Mr. Anil Agarwal,

Dedicated

to

"My Parents"

CONTENTS

LIST OF TABLES

LIST OF GRAPH

Chapter - 1

Introduction

INTRODUCTION

1.1 General

To most people, the term "**obesity**" means to be very overweight. Health professionals define 'over weight' as an excess amount of body weight that includes muscles, bone fat and water. "Obesity" specially refers to an excess amount of body fat. Some people such as bodybuilders or other athletes with lots of muscles, can be overweight without being obese.

Obesity has become a global epidemic affecting the lives and health of millions of people, according to the World Health Organization. It is an accelerating social problem in industrialized countries and is also growing in the former colonial world.

In the media, obesity is typically characterized as an eating disorder or merely an individual problem. But with over half the adult population now obese or overweight in major countries, and the obesity rate rising sharply for adults and children alike during the 1990s, such simplistic approaches serve to obscure the underlying social causes.

Obesity is a condition of an abnormal growth of the adipose tissue due to enlargement of the fat cell size or an increases in the fat cell number or a combination of both. Obesity in often expressed in terms of Body Mass Index (BMI).

Reports from various medical journals indicate that obesity is reaching staggering proportions in Australia, the United States, Britain and other European countries. According to the Australian Bureau of Statistics, in 1999 over 63 and 47 percent Australian men and women were overweight or obese against only 44 and 30 percent men and women, respectively in 1992. Child obesity seems to be of particular concern. Obesity rate in Australian children has doubled in recent years, reaching levels of between 12.5 percent and 30 percent.

In the United States, the 1997 National Health Interview Survey showed that more than 50 percent of adults were overweight. The results were quite similar to Australia: where 62.3 and 46.6 percent of men and women were affected.

Moreover, 1 in 5 adults were obese. Even more alarming, 40 percent of 5- to 8-year-olds were obese. Just seven years earlier, in 1990, the childhood figure was 10 percent.

The current global obese population is over 250 million and still growing. United States and Western European nations have the most number of obese people in the world. According to NIDDK (National Institute for Diabetes, Digestive and Kidney Diseases) estimates 126.9 million or more than two thirds of adult American population is overweight. Over 30 million people are overweight in the United Kingdom. Obesity though is a serious problem in developed nations like United States and Western European countries it is not confined to these nations alone. Obesity is a growing problem in Asia pacific

[2]

countries such as China, India and Australia,. The growth in obesity in the Asian countries is alarming; environmental and behavior changes brought about by economic development, modernization and urbanization, working conditions and more importantly consumption of fat rich food are the key causative factors for this disorder.

1.1.1   Social Structure

- Developed countries have high obesity rates, food deprivation is unusual, and physical activity levels have decreased greatly. lower income households are reported to feature diets composed of foods that tend to be high in calories and fat - contributors to overweight and obesity - since vegetables, fruits and whole grain cereals are more expensive.

- Developing countries have lower obesity rates, particularly in areas of lower Socio economic status populations. People who live in these areas have limited ability to provide enough food, have little access to public transportation and engage in moderate to heavy manual labor.

1.1.2   General Trends

- In many developing countries, obesity co-exists with under-nutrition – a Body Mass Index (BMI) less than 18.5.

- In economically advanced regions of developing countries, prevalence rates of obesity may be as high as in industrialized countries.

[3]

- Globally, women generally have higher rates of obesity than men, although men may have higher rates of overweight.

- Prevalence of obesity in children and adolescents is on the rise in both developed and developing regions.

1.2 Regional Trends

Across the world the epidemic of obesity has been gathering momentum affecting both developed and developing countries.

Europe - Few countries report obesity rates below 10%. Prevalence rates, particularly among women, rise to more than 20% in countries such as the United Kingdom, Germany, Finland and Greece. The most rapid increase is noted in England where the obesity rates have risen three-fold from 1980 to 2001, with levels of morbid obesity (BMI>40) also increasing three-fold among men and almost double among women during the 1990s.

North America - In the United States, obesity is a marked phenomenon affecting one in three adults, more than double the rate of 20 years ago. Ethnic minorities are affected disproportionately with 40% of Mexican American women and 50% of black American women having a body mass index above 30 kg/m^2. Extreme obesity rates, classified as morbid obesity of BMI>40, are as high as 15% among black American women.

Neighbouring Canada experienced an increase of 150% in its overall adult obesity rate from 1985 to 1998 reaching 14.8%.

[4]

Latin America and Caribbean - Evidence of the impact of the nutrition transition is clear in the growing levels of obesity throughout this region. Obesity rates are reported to vary for men from 7% in Peru and Brazil to more than 20% in Paraguay, but among women rates rise as high as 36% in Paraguay.

In the Caribbean, obesity is a significant problem, particularly among women, with correspondingly high rates of type II diabetes. Abdominal obesity among men, using WHO waist circumference limits, ranged from 3% in St Lucia to 8% in Barbados, but among women was found to be as high as 34% in Jamaica, 41% in St. Lucia, and 45% in Barbados. Diabetes studies in Jamaica have demonstrated markedly high risks associated with overweight and central obesity.

Africa - Wide disparities in levels of obesity are found with the highest rates in South Africa, where mean BMI values for men and women are 22.9 kg/m^2 and 27.1 kg/m^2 respectively, but levels of central obesity among women have been assessed at 42%. The South Africa Health Review 2000 indicated obesity rates from 8% among black men to 20% among white men, but among women the rates ranged from 20% for Indian/Asians to 30.5% for black women. In North Africa the prevalence of obesity among women was high. Half of all women were overweight (BMI>25) with rates of 50.9% in Tunisia and 51.3% in Morocco, and obesity rates (BMI>30) in women of 23% in Tunisia and 18% in Morocco, a three fold increase over 20 years.

[5]

In parts of sub Saharan Africa obesity often exists alongside under -nutrition.

Middle East - High levels of obesity exist particularly among women, but often men too, in many countries as diverse as Egypt, the Gulf states including Saudi Arabia. Obesity rates of 25-30% and even higher are not usual in Kuwait, the United Arab Emirates, Bahrain. In Iran obesity rates vary from rural to urban populations rising to 30% among women in Tehran.

Asia - Various Asian populations may be particularly susceptible to the health risks of central obesity, regardless of BMI. Consequently there is an increasing focus on measuring waist circumferences, which can predict individual risk more accurately than body mass index. However, in Japan experts have agreed independently to redefine the obesity cut-off at BMI>25 and have suggested to apply this in the Asian region also. Using this standard, adult obesity in Japan would average 20%, rising to 30% in men over 30 years old, and in women over 40 years old, representing a three to four fold increase over the last 40 years.

China has adopted its own standards defining overweight at a BMI of 24 or more, and obesity at a BMI of 28 or more. However abdominal obesity is defined by a waist circumference of 85 cm in men and 80 cm in women.

Pacific - The link between obesity and type II diabetes is most obvious in this region which has some of the highest levels of adult

obesity. Obesity prevalence rates between 60 to 80 % can be found among men and women in some islands including Samoa and Nauru. In Tonga 60% of the adult population is obese and recently 12% of men and nearly 18% of women were identified with type II diabetes, a doubling of the rate over 25 years. A further 20% were found to be at risk due to elevated blood sugar levels.

1.2.1. Socioeconomic Transition

- Economic development leads to a shift in BMI in developing countries. As the proportion of under-nutrition decreases, the proportion of the overweight population increases.

- In the initial stages of economic transition, the proportion of people with high BMI's increase in wealthier sections of society, while among the less wealthy, under-nutrition remains a concern.

- At the mid point of the transition, overweight and underweight can co-exist in the population, presenting a double burden of disease.

- Towards the later stages of the transition, the prevalence of high BMI increases among the poor population.

1.2.2 Modernization & Urbanization

- Modernization, the growth of industry and technology, was introduced over 50 years ago in the western world. Modernization has led to an abundance of food (particularly high caloric intake) and a decrease in overall physical activity, contributing to increased rates of obesity.

- Urbanization, population growth in large cities, is associated with changes in diet (more reliance on non-traditional foods) and a more sedentary lifestyle

- The number of women entering the job market has increased with economic development, and contributed to an increased dependence on convenience foods and the use of labor saving devices such as microwaves.

- Ethnic groups in many industrialized countries appear to be affected by obesity as a result of modernization and urbanization. Genetic predisposition for obesity is suggested to be a factor that only becomes apparent after exposure to a more western lifestyle. For example:

  o Australian Aborigines have been reported to develop high prevalence rates of obesity, hypertension, and type II diabetes after transitioning to a western lifestyle from their traditional "hunter-gatherer" lifestyle (high physical activity and low-calorie, low-fat, high fiber diet).

  o The Pima Indians of Arizona have a very high prevalence rate of obesity and type II diabetes. Obesity and type II diabetes have been found to be less prevalent among Pima Indians living in Mexico compared to Pimas living in Arizona. The Pimas in Mexico have maintained a traditional lifestyle of higher physical activity and a diet including less fat and more complex carbohydrates.

[8]

1.3 Obesity in childhood and adolescence

Childhood obesity has already become an epidemic in some areas and is on the rise in others. An estimated 17.6 million children under five are estimated to be overweight world wide. The prevalence of obese children aged between in 6 to 11 years has more than doubled since the 1960s. Obesity prevalence in youths aged 12-17 has increased dramatically from 5% to 13% in boys and from 5% to 9% in girls between 1966-70 and 1988-91 in the USA. The problem is global and increasingly extends into the developing world ; for example, in Thailand the prevalence of obesity in 5 to 12 years old children rose from 12.2% to 15-6% in just two years. During the past 20 years, prevalence of obesity among children and adolescents has doubled in America . The United States National Center for Health Statistics suggests that nearly 15% adolescents are overweight or obese. A study conducted in 1990 amongst 3,861 school children reported the prevalence of obesity as 7.5%. In 2000, 38.8 million American adults met the classification of obesity, defined as having a body mass index (BMI) of 30 or more & prevalence of obesity was 19,8% which reflects a 61 % increase since 1991. An International Obesity Task Force (IOTF) analysis has shown that overweight and obesity affects one in 10 children worldwide, but the rate is double in Europe and three times as great across the entire Americas. Obesity in childhood is associated with an increased incidence of hypertension, diabetes, coronary artery disease, osteoarthritis and overall adult life. There is an evidence that children and adolescents of affluent families

[9]

are more overweight than in the past possibly because of decreased physical activities, sedentary lifestyles, altered eating patterns and increased fat content of the diet .

Late childhood, which extends from six years until children become sexually mature at approximately the age of thirteen for girls and fourteen for boys, is labeled by parents as the "troublesome" "sloppy," of "quarrelsome" age; by educators as the "elementary-school" age; and by psychologists as the "gang age," the "age of conformity," or the "age of creativity." Physical growth, which is at a slow and a relatively even rate in late childhood, is influenced by health, nutrition, immunization, sex, and intelligence.

School children will have a good appetite but their food should be selected nutritiously. During 6 to 12 years the rate of growth in children slows down and body changes occur gradually. This period of life in general is known as the latent period of growth. This is applicable mainly for boys. In girls prepubertal acceleration of growth take place during later half of this period. During this stage girls usually outgrow boys. The body requirements of calories and protein are increased steadily. Requirements of the nutrients of children increase from 7-12 years, as there is gradual increase in need because reserves are being laid down for the demands of the approaching adolescent period. The increased requirements of protein would meet demands of the growth. Girls require more protein between 9-12 years of age than boys do, since they are approaching menarche early. During 10 - 12 years,

[10]

children do require more calcium than adults to meet demand for skeletal growth, since blood volume is increased and iron requirements are also increased.

Breakfast is particularly important for a school child. This age group has a tendency to skip breakfast, which is bad. This will make them weak, tired, lethargic and develop lack of concentration. A cereal, milk and fruit will make a good and quick breakfast. Packed lunches should be nutritiously adequate. Dinner is a good time to balance calories at the end of the day. Ideally break fast and lunch should provide major portion of calories and the balance should be from dinner and in-between snacks.

During puberty nutritional needs are increased due to physical growth, hormonal changes and emotional strain. Calories, protein, calcium and iron requirements are particularly increased during this period. Iron is needed for haemoglobin synthesis necessitated by the considerable expansion of blood volume and for myoglobin needed for muscle growth.

Adolescence is a period of transition between childhood and adulthood. It occupies a crucial position in the life of human beings characterized by an exceptionally rapid rate of growth ; these sudden changes create special nutritional needs. The adolescence is considered especially vulnerable nutritionally for several reasons. First, there is an increased demand for nutrients related to the increase in physical growth and development ; second, the change of life style and

[11]

food habits of adolescence affect both nutrient intake and need , third, there are special nutrient needs associated with participation in sports, pregnancy, development of an eating disorder, excess dieting, use of alcohol and drugs, or other situations common to adolescents.

At this adolescent age they start eating out and take snacks in between meals. This may be due to increased requirement or may be the way of socializing. The snacks they eat are full of fats, carbohydrates and sugar. Some of them try to use food as a way to establish their identity, perhaps by over eating or going on a crash diet. Their faulty eating habits can lead to different nutritional deficiency, under or over nourishment, dental caries or eating disorders.

Eating disorders, especially *anorexia nervosa and bulimia* are common problems in adolescent girls. It is due to this region that the girls of this age group become very conscious about their body figure and it in turn influences the way they eat. These types of problems are on the a rise now a days. Obesity is another important problem seen in both sexes of this age group. They must be encouraged to have a healthy nutritional habit and to have proper physical activity.

Adolescent girls need an increased iron requirement because of the onset of menstruation. The girls need to ensure adequate intake of iron as they lose 0.5 mg/day during menstruation. They require 30 - 35 mg iron per day. To ensure sufficient quantity of iron, whole grain cereals, green leafy vegetables, liver, raisins and dried dates should be included in the diet. Bone growth demands calcium. A good calcium

intake is also important during this period for strong and healthy bones and teeth and to prevent osteoporosis in later life. Diet must contain at least 2 glasses of milk / day or any other dairy product. Calcium is also present in good quantity in fish, green leafy vegetables and ragi. The need for thiamine, riboflavin and niacin increases directly with increased caloric intake. B_{12} is essential for DNA and RNA synthesis and is needed in higher amounts when rapid tissue synthesis is underweight rapidly. Food sources that include these vitamins are bran, peanuts, peas, beans, liver, milk, green leafy vegetables, egg white, fish and wheat germ.

Obesity is most prevalent form of malnutrition in developed countries. According to one estimate 20-40% of adult and 10-20% of children and adolescents are affected with this problem in developed countries. In 1997, the incidence of obesity in India was 7-9% and it was more prevalent in urbanities. Although this number was small as compared to America and other countries,

In India, weight problems are associated with economic status. Almost all those who are overweight have above – average incomes, while the underweight have lower incomes. (Dr. Marget Bently) This is further exaggerated by over feeding and poor physical exercise. This situation tends to promote the glycogenesis process.

According to Nutrition foundation of India, nearly one third of the males and more than half of females belonging to upper middle class

[13]

family' of Delhi are currently over weight (BMI>25). The prevalence of abdominal obesity in this group is even higher.

In the urban population of India, refined wheat and rice have virtually displaced coarse grains and millets as the staple cereal, resulting in a substantial reduction in fibre content in the diet and possibly, also the content of macronutrients such as vitamin-B complex, zinc and chromium, etc. As the population ascends the socio-economic scale, cereals intake declines, and the intake of sugar and fats generally increases.

Every one needs a certain amount of body fat for stored energy, heat insulation, shock absorption and other functions. As a rule, women have more body fat than man. Most-health care providers agree that men with more than 25% body fat and women with more than 30% body fat are obese.

1.3.1 Obesity : its measure and classification

Measuring the exact amount of a person's body fat is not easy. There are simpler methods to estimate body fat viz. one is to measure the thickness of the layer of fat just under the skin in several parts of the body ; another is sending a harmless amount of electricity through a person's body. Both methods are used at health clubs and commercial weight loss programs. Results from these methods, however, can be inaccurate if done by an inexperienced person or on some one with severe obesity.

[14]

Because measuring a person's body fat is difficult, health care providers often rely on other means to diagnose obesity. Weight for height tables, which have been used for decades, usually have a range of acceptable weights for a person of a given height.

In recent years, body mass index (BMI) has become the medical standard used to measure overweight and obesity. BMI uses a mathematical formula based on person's weight and height . BMI equals weight in kg divided by height in meters squared (kg/m^2). A BMI of 25 to 29.9 indicates a person is overweight. A person with a BMI of 30 or higher is considered obese.

The BMI can be compared with following ranges :

Below 20 – under weight

20 - 25   - Acceptable / Normal weight

25 - 30   - Over weight

30 - 40   - Obese

Over - 40   - very obese

According to BMI obesity in classified into 3 grades-

(1) Grade I obesity : people having a body mass index (BMI) more than 25 but less than 30. Overweight, does not affect their health, they lead a normal health and life expectancy is above normal. They may reduce weight on their own.

(2) Grade ii obesity: The BMI is more than 30 and less than 40. Doctors & dietitians should treat these patients

[15]

Although they appear to be in good health, they have reduced tolerance to exercise and with shortness of breath on exertion, they are unduly fatigued. This is due to the burden of increased weight they carry always and reduced capacity of the circulatory and respiratory systems that are handicapped by masses of internal fat and fatty infiltration of muscles. For mechanical and metabolic reasons these patients are at increased risk of diabetes, arterioscleroses, hypertension, etc.

(3)   Grade III obesity :- The body mass Index is above 40; these patients are in pathetic condition. Their day to day activities are restricted due to their enormous mass and they are susceptible to diseases mentioned in grade II. They are susceptible to arthersclerosis, prone to accidents and have serious psychological disturbance

There are many factors that contribute to obesity and these causes vary from person to person . Genetic inheritance probably is the main factor that person's chance of becoming fat are more than any other factor. One estimate says that heredity contributes between 5 to 25 % of the risk for obesity and now there are number of genes found to be associated with obesity. These genes enhance the storage of fat when food is limited and cause an increased risk of obesity when food is abundant and energy expenditure is reduced .

1.3.2 Obesity and life style

Genes do not destine people to a life time of obesity, however environment also strongly influences obesity. This includes life style behaviors such as what a person eats and what is his or her level of physical activity.

Americans tend to eat high-fat foods and put taste and convenience ahead of nutrition. Also, most American do not get enough physical activity

Convenience foods frequently have high levels of dietary fat. Many surveys show that school children eat over one third of their every meal as fat. Children tend to have high sodium intakes as a result of the spices and sauces which are an integral part of many fast foods and snacks.

Obesity is common in prosperous countries like U.S.A, UK and in people of the higher economic strata of society in developing countries.

Studies conducted in the last 20 to 30 years show a strong correlation between obesity and lack of physical activity. As a result of increasing community violence, danger and parental fear, children are more frequently taken to school by car or bus rather than walking or cycling. Many schools have reduced staff salaries for supervision of physical activities such as team games and individual exercise. The failure of schools to provide and encourage daily physical activity has

also been a major cause for reduced energy expenditure and weight gain among children.

Obesity generally increases with age. Infants with excessive weight gain have an increased incidence of obesity in later life. About 1/3 of the obese adults have been so since childhood. Men are found to gain most weight between the ages of 29 & 35years,while women gain most weight between the 45 and 49 years of age.

Religion is also associated with obesity. One study shows Muslims women were more likely to be overweight or obese than women from other religious groups (primarily Hindu). For the nutrition variables, women who daily consumed non green leafy vegetables were more likely to be overweight or obese than those who ate them weekly, occasionally or rarely. In addition women who reported eating fruits daily or weekly were more likely to be overweight or obese than those who ate them occasionally or rarely.

During the school, changes in dietary practices and new lifestyle behavior are developed outside the control of home. The child becomes more autonomous, selects preferred food, eat at unconventional times and may disregard healthy eating messages. It has also been established that the dietary habits that emerge during this period remain, at least in part, as the individual progresses into adulthood. Hence, the diets of tomorrow's adults are being determined by choices, children are making today. Generally, children consume potato crisps, soft drinks, chocolates, candies or other biscuits and

puddings (Eves et al., 1997; Noble et al., 1998). Intake of fibre and micro nutrients in children population has repeatedly been found to be low. It is not only the total nutrient intake of children which is of concern, but their pattern of eating is also of significance.

Indian dietary patterns have changed significantly over the past few decades ; overnutrition has replaced undernutrition as the largest nutrition related problem facing both children and adults. Although the percent of calories from total fat has declined over the past 30 years, but the intake of total calories has increased. An increase in calorie consumption is a major cause of weight gain among children. Research studies have indicated different results on energy (K. Calories) consumption between obese and non obese individuals. Some show that obese consume more, others show they may consume less calories. The big difference may be attributed to dietary ingredients and their chemical make up, such as fat or carbohydrate. High carbohydrates (particularly those containing simple sugars) stimulate the production of insulin, which drives fat into fat depots and prevents its breakdown resulting in excessive fat accumulation. High insulin also causes insulin resistance resulting in a greater conversion of blood sugars to fat and increased fat storage.

1.3.3 TV viewing and obesity

Children's diets have changed little over the last two decades despite widespread media attention on the healthy diet. They spend a great deal of time watching television and hence, being exposed to

advertisements for food products. Children want to have, to do and to be what is popular at that moment. Television and other media advertising for snack foods and fizzy drinks are strongly directed at school children. Many correlational studies have demonstrated an association between the duration of TV viewing and levels of overweight and obesity in both children and adolescents (Andersen et al., 1998). However, such cross sectional studies fail to demonstrate a causal link. Kaur and colleagues (2003) conducted a prospective study. At the three year follow up it was found that those who watched 2 or more hours of TV per day were twice as likely to become overweight during the course of the study. Data from two other longitudinal studies produced similar findings (Francis et al., 2003, Proctor et al., 2003). These studies support the notion that excessive TV viewing does contribute to weight gain. Interestingly, in a sixth month intervention study by Robinson (1999), in which children's television viewing was significantly limited, gains in BMI and fat deposition were significantly reduced compared to a no intervention control group. Limiting exposure to television reduced weight gain again supporting the causal notion.

Recent data show that the incidence of obesity was highest among children who watched four or more hours of television a day and lowest among children watching an hour or less a day.

The effect of TV viewing on weight gain seems to be, at least in part, due to a lack of physical activity rather then the act of viewing

[20]

itself (Hu et al., 2003). However, TV may not just promote sedentary behaviour. There is evidence that it also stimulates food intake. TV viewing is associated with over consumption, specifically of snack foods in girls (Francis et al., 2003). Children who eat their meals in front of the TV tend to consume more dietary fat (Coon et al., 2001). Woodward et al. (1997) demonstrated that the number of hours of TV viewing by teenagers was significantly correlated with the number of unhealthy food items consumed per day.

There is another way TV viewing may induce food consumption. Furnham and colleagues (1997) noted that over two consecutive weekends during programs scheduled for children, 37% of the US TV channels and 49% of the UK TV channels' advertisement were for food. The majority of these were for snack foods, followed by breakfast cereals and then fast food outlets.

Costa (1983) revealed a link between food advertising and several cases of eating disorders. Most of the times, children can't resist very attractive, colorful and appealing advertisements and insist their parents of buying those products whose television advertisement they like very much. Only due to its two minute advertisement, maggi noddles have become so popular among children while it contains starch only and is a poor source of other nutrition

Some schools are even providing, on a daily basis, fast foods, such as pizza, hamburgers, and French fries, Soda and fruit juices are believed to be responsible for a 2 to 3 fold increase in sugar intake

[21]

among children and adolescents. Data show that the average Indian consumes 56 gallons of soda/year and that the average teen may be drinking as much as 65 gallons.

Today, with the increasing popularity of television and the computer with the Internet to boot it, in addition video games are all responsible in causing children to lead inactive lives. Also increasing competition among children, causing them to spend more time with their school books leaves them very little time to play and indulge in physical activity.

1.3.4 Various diseases induced by obesity :

Obesity increases the risk of various chronic health problems. Obese people are more likely to have high blood cholesterol levels, this increases the risk of arteriosclerosis, a condition in which fatty deposits build up on the inner lining of the arteries. This may contribute to high blood pressure and coronary artery disease. Arterial thrombosis and embolism, which is blockage of a blood vessels by a blood clot, occurs more often in obese people.

More than 80% of obese people with type II Diabetes are overweight. The IOTF analyses, undertaken for the world Health Report 2002 and associated WHO Global Burden of Diseases research indicate that approximately 58% of diabetes mellitius globally (as well as 21% of ischaemic heart disease and 8-42% of certain cancers) can be attributed to BMI above 21 kg/m^2. However in Western countries around 90% of type II diabetes cases are attributable to weight gain and childhood overweight and obesity now

[22]

leading to an unusual pattern of premature type II diabetes, which is particularly difficult to manage once established. It may be that being overweight causes cells to change, making them less effective at using sugar from the blood. This then puts stress on the cells that produce insulin and makes them gradually fail.

Certain cancers such as prostrate cancer, breast cancer and cervical cancer are more common. Women who are obese have greater risk than women who are not obese for cervical cancer, breast cancer or gallbladder cancer. Men and women who are obese have an increased risk for colon cancer or rectal cancer. Men who are obese have an increased risk for prostate cancer. Excess weight can put strain on the joints, leading to osteoarthritis, especially in the hips and knees.

Sleep apnea, a respiratory disease is also associated with obesity .In *sleep apnea*, the person stops breathing several times an hour for 10 or more seconds while sleeping. Too much fat in the person's neck blocking the airway specially during sleep causes this. *Sleep apnea* can also be caused by a problem in the portion of the brain that controls breathing. People with *sleep apnea* do not sleep well.

People who are obese are more likely than people who are not obese to have gastro reflex disease (GERP) of which heart urn is a major symptom

BMI Values correlated with disease risks :

BMI	Obesity Class	Risk to health
<18.5	Under weight	The lower the BMI, the greater the risk
18.5 through 24.9	Normal	Very low risk
25.0 through 24.9	Over weight	Increased risk/high risk
30.0 through 34.9	Class I Obesity	high risk/very high risk
35.0 through 39.9	Class II obesity	Very high risk
40.0 or above	Class III obesity	Extreme risk

According to the Center for Disease Control, 2000, 60% of over weight children between the ages of 5 to 10 years of already have at least one risk factor for heart disease, including elevated blood cholesterol blood pressure or increased insulin levels that lead to hyper tension, diabetes and arteriosclerosis.

Most of the studies conducted across the society on prevalence of obesity revealed that genetic dietary pattern and economic strata are the key factors for its genesis. Inception of luxury items, indoor entertainment and playing objectives in the upper affluent society seems to be other factors contributing to obesity problem. Contribution of these factors to obesity in children of economically rich people has not been studies adequately.

Thus the present study was under taken with the following specific objectives keeping in mind that the results of study might pin point the relative contribution of these factors to obesity.

Objectives

1. To identify the Nutritional status of Affluent children in Jhansi city.

2. To assess the impact of the dietary pattern on the prevalence of obesity in children of affluent society in Jhansi city.

3. To find out the factors responsible for the prevalence of obesity.

4- To compare the prevalence of obesity between the children of upper middle class families and lower middle class families in Jhansi city.

Chapter - 2

Review of Literature

REVIEW OF LITERATURE

Nutrition research in India has focused primarily on the problem of undernutrition, particularly among vulnerable women and children. There is some evidence of an emerging nutrition transition in India. Data from other developing countries demonstrate that resource-poor setting, rising urbanization and improvements in economic development lead to concurrent under-and over nutrition in the population Recent data from the Indian National Family Health Survey (1998/99) reports a significant proportion of overweight women, coexisting with high rates of undernutrition and anemia .

Another study shows that one in eight residents is overweight or obese. And in some prosperous regions, rates are approaching American levels, for example 37% of residents of large cities in Andhra Pradesh are over weight or obese. At the same time, an equal number, 37% are under weight, and about 8% of residents are severely malnourished (Andre Picard, 2001)

Small –scale studies conducted in the 1990s, based mainly on urban samples, suggest that the proportion of the overweight population in Indian towns and cities is large and increasing, ranging form 33 to 51% . A study in North India conducted on 3575 men and women found the urban prevalence of overweight to be more than double that of the rural population, with 27% having a body mass index (BMI)> $25kg/m^2$ compared with 11% in the rural population . Data collected by the National Nutrition Monitoring Bureau in 1990 reported

that 4.1% of Indian women had a BMI>25kg/m^2, with no increase in this proportion between 1970 and 1990 . Popkin and Doak (1998) reported the results of a 1988 –1990 study in India based upon 12,361 individuals in which 3.5% of the population was found to have a BMI> 25 Kg/m^2 and 0.5% BMI> 30kg/m^2. The recent NFHS 2 data for India show that more than one third of women aged 15-49 years have a BMI< 18.5 kg/m^2 whereas nearly a quarter of urban women, who account for 27% of the sample population, are overweight or obese . In the state of Andhra Pradesh in which 26% of the sample population are urban, 25% women are overweight or obese. This compares with the large cities, which account for 41% of the population, in which 37% of women have a BMI > 25 In contrast, 42% of rural women have a BMI< 18.5 .

The World Development Report showed an increase in the consumption of fat saturated fat, sugar, salt, and vegetable ghee (clarified butter) in India. National surveys by the National Nutrition Monitoring Bureau show that 5% of the population consumes 40% of the available fat . Shetty (2000) reported that high income groups in India consume a diet with more than 32% of the energy coming form fat. Data from NFHS 2 reported large differences in dietary diversity between urban and rural women, with urban women reporting regular consumption of milk, fruits and curd, and nearly double the frequency of eating eggs and meat compared with rural women.

Bose et al. (2004) studied the level of undernutrition among 10-16 years old Bengalee boys of Nimta, North 24 Parganan, a suburb of Kolkata. Results were found that the overall rate of under nutrition was 37.65%. The rate of undernutrition varied between 19.3% among 16 years old to 53.4% at age 14 years. There was a consistent increase in the rate of undernutrition from 10 (36.5%) to 14 years (53.4%). Thereafter , there was a steady decline at age 15 (36.8%) and 16 (19.3%) years.

Monga (2004) investigated the prevalence of obesity and related factors among 1238 school children of 7 to 9 years age in six schools representing three different socio-economic groups in new Delhi , India. The results showed that 6.22% of the children were obese, 8.24 % were overweight and 19.39% were underweight Prevalence of obesity in upper middle and lower middle income group was 10.28% and 0.48%, respectively.

Anwar et al. (2003) studied nutritional status comparison of rural with urban school going children aged 6-12 years in Faisalabad district, Pakistan. They found that a total of 36.1% children were stunted and 45.3% were underweight : 25.2% were below standard weight from height. Among the urban children, 33% were below the standard for height (stunted), 32.3% were below the standard for weight (underweight) and 32.7% were wasted. Among the rural children, 40.9% were stunted , 64.7% were underweight and 33.3% were wasted. The rural female group was the most affected and

malnourished with 61.8% stunted and 84% underweight and 67.1% wasted .

Freedom and Khan (2002) determine whether childhood height is related to adult adiposity and whether the association is independent of child hood level of BMI and triceps skin fold thickness. They found that, as compared to the children whose height were below the gender and age specific median, a child with a height for age above the 95th percentile (P) was approximately 2.5 times as likely to have a BMI 30 Kg/m^2 and approximately 5 times as likely to have a skin fold sum > 90th P in adulthood. Although height and adiposity were associated (r=0.29) among children, the observed longitudinal relation persisted after controlling for BMI and the triceps skinfold thickness in childhood. For example among children with the same BMI, each 10cm difference in height was associated with difference in adulthood of 0.9 kg/m^2 for BMI and 4mm for the skinfold some. Although these results need to be confirmed in other studies and it is possible that information on childhood height could be used to identify more accurately the children who are to be obese in later life.

Gaha et al. (2002) surveyed 1569 urban school children of Sausse (Tunisia) to study the prevalence of obesity and overweight and their relationship with cardiovascular disease risk factors. Results showed that overweight was significantly higher in girls(16.1%) than in boys(11.6%) .Obesity was slightly higher in girls (3.7%) than in boys (2.7%) . Girls had higher BMI, diastolic blood pressure, cholesterol and

HDL cholesterol level than boys. Overweight was significantly higher in children who did not practice sports at school.

Guijing et al. (2002) examined the trend of obesity associated diseases and economic costs in youths (6-17 yrs of age) . They found that the instances of diabetes nearly doubled (from 1.43% to 2.36%), obesity and gallbladder diseases tripled (from 0.36% to 1.07% and 0.18% to 0.59%, respectively), and *sleep apnea*. increased fivefold (0.14%to 0.75%). Ninety six percent of discharges with a diagnosis of obesity listed obesity as a secondary diagnosis. Asthma and some mental disorders were the most common principally diagnosed diseases, when obesity was listed as a secondary diagnosis.

Obesity associated annual hospital costs (based on 2001 constant US dollar value) increased more than threefold; form $ 35 million (0.43% of total hospital costs) during 1979-1981 to $ 27 million (1.70% of total hospital costs) during 1997 –1999.

Manira (2002) studied few selected factors and their association with nutritional status of 1000 adolescent girls aged 10-19 years, studying at 6 different schools and college from urban region of Dhaka city, Bangladesh. They revealed that according to height for age and weight for height , 52 %, 17.6 % , 13.5 % and 16.2% of girls were normal, stunted, wasted, and stunted & wasted respectively. According to weight for age, only 18.9% were normal, others exhibited various grades of malnutrition, where as 6.0% had severe grade of malnutrition. Among the factors studied , calorie intake (P<0.001), age

at menarche (p<0.005) , and overall socio-economic and educational status (p<0.05) exhibited a significant association with nutritional status. Better immunization and nutritional knowledge status were also the influential factors for better nutritional status during adolescence.

Neumark et al. (2002) examined the prevalence of obesity in Minnesota urban youths reaching the healthy people 2010 objectives for obesity and intake of fat, calcium fruits, vegetables, and grains and then compared prevalence rates across socio-demographic characteristics. Results showed that the considerable gaps were seen between the existing prevalence rates for obesity and nutrient and food patterns and the targeted healthy people 2010 prevalence rates. About 12.5% of the girls and 16.6 % of the boys had body mass index values at or greater than the 95th percentile (target = 5%). Only 29.5% of the girls and 42.5% of the boys were meeting the daily recommended intakes for calcium (target = 75%). Similarly, percent of youths consuming the recommended amounts of fat, fruits, vegetables and grains were lower than the targeted percent. There were large socio-demographic disparities in obesity and eating patterns, particularly in socio-economic status.

Steller et al. (2002) surveyed 4 schools from Seychelles to find out the prevalence of overweight and obesity and related risk factors in the children. These workers found, 12.6 % (95 % confidence interval: 11.8-13.5%) of the children were overweight and 3.8% (3.3-4.4%) were obese. Weight gain during the first year of life was strongly associated with subsequent overweight (odds ratio1.46, 95%

confidence interval 1.27, 1.67) and obesity (1.59, 1.29-1.97) in childhood, independent of birth weight. Increase in maternal BMI (Kg/m^2) was also associated with overweight (1.07, 1.03-1.1) and obesity (1.09, 1.04-1.14) in the offspring.

Subramanyam et al. (2003) examined the prevalence of obesity and overweight in adolescent public school girls (10-15years of age) of Chennai .The result revealed a prevalence of overweight to the tune of 9.6%

Terell (2002) studied the prevalence of overweight and obesity in 1200 students (aged 11 to 14 yrs) of two schools in the Carolinas (U.S.A.). They found that 32 .4 % students were overweight and 16.4 % obese. A number of factors i.e., physical activity, poor nutrition habits, economic and social factors were responsible for overweight and obesity.

Van Lenthe et al. (2002) investigated the association between neighborhood deprivation and overweight along with effect of education level, age & sex. Stratified analyses showed a stronger association between neighborhood deprivation and overweight in females compared to males, and in older (49 years of age) compared to younger participants. The pattern of increasing odds ratios of overweight by neighborhood deprivation was generally similar in all educational groups, the highest educational group being the exception with no association between neighborhood deprivation and overweight.

[32]

Venkaiah et al. (2002) studied diet and nutritional status of rural adolescents in India. These workers reported that the extent of undernutrition was high among adolescents and was higher among boys than girls. Adolescent girls in the rural areas could be at greater risk of nutritional stress because of early marriage and early conception before completion of their physical growth.

Yernell et al. (2002) carried out a study on prevalence and awareness of excess weight in 2484 children aged mainly 13 to 14 yrs in Northern Ireland. These workers found that the prevalence of overweight and obesity in boys was 16 % & 4% respectively. In girls , 16 % were overweight and 2% were obese .

Agarwal et al. (2001) studied ponderosity indices body mass index (BMI) and skin fold for affluent Indian school going adolescents. Measurements were recorded in healthy affluent schools of twelve cities in India. Skin fold thickness at yearly intervals was derived for each sex and was related to sexual maternity. BMI and skin fold thickness were higher in adolescent girls.

Alaimo et al. (2001) investigated associations between family income, food insufficiency and being overweight in US children aged 2 to 7 and 8 to 16 years. Investigators reported that among older non-Hispanic white children, children in families with low income were significantly more likely to be overweight than children in families with high income. There were no significant differences by family income for younger non- Hispanic white children, non -Hispanic black children

[33]

or Mexican American children. After adjusting for confounding variables, there were no differences in overweight by food sufficiency status, except that younger food insufficient girls were less likely to be overweight, and non-Hispanic white older food-insufficient girls were more likely to be overweight than food- sufficient girls (P<.10)

Berg et al. (2001) investigated the frequency of overweight and obesity based on body mass index (BMI) values among boys & girls from four age groups: 9,12,15 and 18 years. These workers found that 12.3%,11.6% and 11.4% of the boys in the 12-15-and 18-year old age groups. and 6.8%, 5.5% and 4.8% of the girls in the same age groups were overweight and 7.9%, 8.9% and 7.3% of the boys and 5.1%, 4.2% and 3.9% of the girls were obese.

Clark et al. (2001) described the prevalence of obesity , associated factors, and approaches to weight in an inner city African – American community . They found that 60 % of participants were overweight (BMI 25 Kg/m2) and 31 % were obese (BMI 30 Kg/m2) . In multivariate analysis, women earning $15,000 – 30,000 , aged 40-60 were more likely to be obese . Less likely to be obese were smokers , daily drinkers , and those with "good " or " excellent " health . 61% of obese participants reported trying to lose weight , while 36% of normal weight participants were trying to gain weight. Of those trying to lose weight, 35% were using recommended approaches and 26% received " the professional help they needed to control their weight.

Gulliford et al. (2001) evaluated the distribution of body mass index (BMI) and subcutaneous fat in children of African or Indian subcontinent. Overweightness was prevalent and distribution of subcutaneous fat was central. Work is needed to determine whether these findings are associated with adult patterns of fat distribution and metabolic abnormalities. The results showed that higher BMI was associated with higher BMI in the child's parents, higher reported birth weight, old age of child's mother, smaller family size and with higher maternal, educational attainment.

Kapil et al. (2001) surveyed 870 affluent school children of Delhi, out of which 64.5% were boys. Sixty five percent of the children belonged to nuclear families. The over all prevalence of obesity according to international cut off points (BMI criteria) was 7.4%, about 8% of the boys and 6% of the girls were obese. The centiles for overweight and obesity corresponding to a body mass index of 25 and 30 kg/m2 were calculated by sex. Workers reported that a BMI of 30kg/m2 at 98.4 centile for males and 98.0 centile for females respectively. Similarly, at BMI of 25 kg/m^2 for males and females, corresponding values of centile was 86.7 and 86.9 respectively.

Moreno et al. (2001) investigated socioeconomic factors and trends on overweight prevalence in the whole population of children(age 6-7 yrs) and adolescents(13-14yrs)in Aragon(Spain) from 1985-1995 . These workers found that overweight prevalence was higher in the rural than in the urban areas . In the adolescents, the probability of overweightness was higher in the public than in the

private schools. Their results also showed that a significant increase in the prevalence of overweightness in children in the region of Aragon (Spain) during the 1985 to1995 decade, specially in males

Singh et al. (2001) assessed nutritional status of 70 girls belonging to the age group 13 to 18 years from Sunderpur , an urban community of Varanasi. They reported that 70.0% adolescent girls had BMI <20% ; 51.43% study subjects were suffering from Chronic Energy Deficiency (CED). Stunting (height ; for ago alpha 90%) was present in 10% of adolescent girls. Their average weight ; height, MAC were 83.45% , 93.08% and 82.05% of the corresponding estimated reference value.

Van der et al. (2001) carried out a study on 'Prevalence of and cardio vascular risk factors associated with obesity and under nutrition in the Gambia. They found that the prevalence of under nutrition (body mass index <18 kg/m2) was 18.0% : total strata of society was affected ,and prevalence of obesity (body mass index > 30 kg/m(2)) was 4.0% but was higher (32.6%) among urban women of 35 years age or older. Cardiovascular risk factors were more prevalent among obese participants.

Wang (2001) examined the prevalence of obesity and compared its association with socio economic factors (SES) across countries. He found that the prevalence of obesity and over weight was 11.1% and 14.3%, respectively, in the U.S., 6.0% and 10.0% in Russia, and 3.6% and 3.4% in China. The relationship between obesity and SES varied

across countries. Higher SES subjects were more likely to be obese in China and Russia, but in the U.S. low-SES groups were at a higher risk. Obesity was more prevalent in urban areas in China but in rural areas in Russia.

Goulding et al. (2000) in a cross sectional study of 200 girls and 136 boys aged 3-19years, found that the overweight or obese children had no relation with body weight & bone development during growth ; their bone mass and bone area were low for their body weight.

Maffeis et al. (2000) studied 530 children of 7-11year age to asses the relationship between nutrient intake, partitioning of food intake, parent's overweight and adiposity in children. They found that diet composition did not contribute to explain the children's adiposity when the parent's overweight was taken into account. However, the percentage distribution of the intake of energy among the different meals, particularly at dinner, contributed to explain inter individual variance of fatness in children of both sexes.

Anand et al. (1999) studied nutritional status of adolescent school children in rural north India. These workers found that the prevalence of stunting drops down sharply at 14 years of age. The prevalence among girls is along similar lines, through the number of girls in each age of group is smaller. The increase in mean height is about 8 cm per year among boys and 5 cm per year among girls in the

age group below fifteen years. Prevalence of thickness in girls is lower than in boys.

Hitchings and Moynihan (1998) studied the influence of television advertising on children's food choices. Forty four children aged 9-11 years from private and state schools in Newcastle-upon-Tyne from a variety of social class areas were interviewed to determine which television advertisements for food they remembered. Brand specific information on food intake was obtained using a 3 day food diary. Spearman's correlation was carried out between the number of foods for which advertisements could be remembered and the number of times these foods were consumed. A relationship was found between the foods for which the children could remember the advertisement and the number of foods which they ate (r=0.58). For individual food groups the relationship between foods remembered and foods consumed was strongest for soft drinks (r=0.68), crisps and savoury snacks (r=0.61). Four out of 10 of the most frequently requested foods were amongst the 10 most frequently recalled television food advertisements. The results supported the hypothesis the television advertisements influence food choice.

Gulan et al. (1998) compared the efficiency of two types of obesity treatment: a family based approach, in which the parents were the exclusive agents of change, and a more conventional approach in which children were responsible for their own weight loss. Sixty obese (aged 6-11 yrs) were followed for a year and it was found that the

family- based approach induced more behavioral changes as well as greater weight loss than the conventional approach.

Lewis and Hills (1998) examined the nature and significance of food advertising on 103 children of mean age 9.75 years. Half of the 828 advertisement were for food products, 60% of which were for breakfast cereals and confectionery/snacks. Food advertisement used significantly more animation stories, humour and the promotion of fun/happiness/mood altertion. Significant interrelation between advertisement type and overweight were observed on ratings of perceived health and appetite for sweets. It was concluded that while small changes were apparent, advertisements during children's television watching were dominated by those for foods of questionable nutritive value, in a manner designed to engage attention and response.

Wurmser et al. (1998) studied the relationship between high risk of obesity and a reduced resting metabolic rate (RMR) in 93 healthy girls(aged 8-12years) in a cross sectional study. Children were classified into four risk groups, on the basis of their (and their parents) weight status. It was found that the overweight girls with both parents overweight had the lowest energy expenditures.

Schmitt et al. (1989) studied the interrelation between television advertising and nutritional behaviour by questionnaire sent to 509 school children, 6 to 10 years old, and their parents from an urban and a rural area of Moselle. Television was watched daily by 97.45% of the

children. Viewing time was about 25 hrs. weekly. Snacks, usually sugary or fatty products were eaten by 75% of the children while viewing. Television advertising of food products had a marked effect on the children. 74% being were able to quote at least 1 advertisement and 75% consumed such products regularly. The more frequently children viewed television, the more frequently they consumed such products.

Jason et al. **(2003)** studied the effect of television (TV) food advertisement/commercial on food consumption in children. They found that there was no significant difference in the number of non-food advertisement recognized between the lean and obese children: the obese children did recognize significantly more of the food advertisements. The ability to recognize the food advert was significantly correlated with the amount of food eaten after exposure to them. The overall snack food intake of the obese and overweight children was significantly higher than the lean children in the control (non-food advert) condition. The consumption of all the food offered increased post -food advertisement with the exception of the law-fat savoury snack. These data demonstrate obese children's heightened alertness to food related cues. Moreover, exposure to such cues induces increased food intake in all children. As suggested the relationship between TV viewing and children obesity appears not merely a matter of excessive activity. Exposure to food adverts promotes consumption.

Chapter - 3

Material & Methods

MATERIAL & METHODS

3.1 Locale of Study

For carrying out the present study, Jhansi city was selected purposively as the locale of the study, as this district has sufficient number of upper middle class and lower middle class families.

3.2 Sampling Procedure :-

3.2.1 Selection of Site :-

A list of different schools of Jhansi city was prepared. From this list , 2 private and 2 government schools were randomly selected. These 4 schools were, Modern Public School, Rani Laxhmi Bai Public School, Suraj Prasad government girls inter college and Bhanu Devi Goyal Saraswati Bal Vidya Inter College .

3.2.2 Selection of respondent : -

The random list of school children in the age group 6-17 years from 4 schools was prepared. These school children were equally divided into two groups i.e upper middle class and lower middle class. The students who were studying in public school, were considered as upper middle class family and those studying in non public school were considered as lower middle class family. 300 children each from upper middle class and lower middle class family, were randomly selected. The children of both the groups were further subdivided into equal number of boys and girls. Thus, 600 respondents from Jhansi city were selected. (Fig. 1)

[41]

Fig. 1 Sampling Design

U.P.. State

↓

Jhansi City

↓

Upper middle class   Lower middle class

↓   ↓

Rani Laxmi   Modern   Suraj Prasad   Bhanu Devi Goyal
Bai Public   Public   Girls Govt.   Saraswati Vidya
School   School   Inter College   Mandir Inter College

75   75   75   75   150   150

Girls   Boys   Girls   Boys   Girls   Boys

300   300

600 Total Sample

[42]

CITY MAP OF JHANSI

Location Map-Jhansi

UP
MP
Jhansi

Narayan Bagh
Laxmital
Medical College
To Kanpur
N.H. 25
Kathhyean Jain Temple
To Khajuraho
To Mauranipur
To Orchha
Risala Chungi Cross
Bus Stand

To Jhansi
Bara Bazar
Chowk Rani Mahal
Minarva Cross
Ambedkar Cross
Suraj Prasad Girls Govt. Inter College
Sadar Bazar
Nav Bharat
Cantt.
Rani Laxmi Bai Public School

Manik
Fort
Laxmi Bal Park
State Museum
Jhokan Bagh Cross
Collectorate Cross
G.P.O.
Jhansi Hotel
To Deogarh
To Lalitpur N.H. 26

To Gwalior
Alla Tal
B.K.D. Cross
Ellte Cross
Allahabad Bank Cross
G.P.O. Cross
Modern Public School
St. Jude Church

Bhanu Devi Goyal Saraswati Vidya Mandir, Inter College
To Gwalior
To Datia

Commissionary
Circuit House
Veerangana
Chitra Cross
Rly. Stn. Jhansi

To Kanpur
To Gwalior
Sipri Bazar
Pahuch Dam
To Shivpuri
To Bombay
To Allahabad

LEGEND

Symbol	Meaning
●	Main Crossing
▦	Railway Line
★	Rani Mahal/Museum
g	Head Post Office
▣	School

3.3 Development & pre -testing of questionnaire :

A well structured questionnaire related to socio-economic status and 24 hour dietary recall was prepared. Pre-testing of the questionnaire was done on 50 respondents using interview method. Based on the response obtained from pre-testing and difficulties faced, slight modification was made in questionnaire to make it more functional.

3.4 Variables and their measurements :-

3.4.1. Independent Variables :- independent variables included socio personal and family variables of respondents.

3.4.1.1 Socio -personal variables:-
Age : -

Age was measured as the chronological age of respondents at the time of interview. Information on age was provided from schools. All school children were listed according to following age groups and given the scores as follows :

Age (in years)	Scores
Below 7	1
7 - 9	2
9- 12	3
12 - 15	4
15 -18	5

Sex : -

Respondents were divided into two groups and scores given to different groups were as follows :

Sex	Scores
Male	1
Female	2

Education of respondent : -

Education was operationalized as the number of years of formal education obtained by the respondents. Scores assigned to different categories were as follows :

Standard	Score
I - III	1
IV - VI	2
VII - IX	3
X-XII	4

Religion :-

It is defined as a prevalent system of faith and worship, practice of sacred sites, recognition of God and duty towards him. The subjects of the present investigation were grouped into four categories i.e. - Hindu, Muslim, Sikh, Christian. The Scores were assigned as follows :

Religion	Scores
Hindu	1
Muslim	2
Sikh	3
Christian	4

Food-Habits : -

This refers to the type of Food stuffs eaten by the respondents scores given to each categories were as follows :

Food habit	Scores
Vegetarian	1
Non - vegetarian	2
Eggetarian	3
Non - vegetarian (occasionally)	4

3.4.1.2. FAMILY VARIABLES : -

Education of Parents

Education was operationalised as the number of years of formal schooling of parents. Scores assigned to different categories were as follows :

Education	Scores
Illiterate	1
Primary	2
Middle	3
High School	4
Intermediate	5
Graduate	6
Post Graduate	7

[45]

Occupation of Head of the family : -

It has been defined on the specific work which a person does to earn livelihood. Scores assigned to different categories were as follows :

Occupation	Scores
Business	1
Service	2
Agriculture	3
Any - other*	4
(*C.A., Doctor)	

Type of Family : -

Family type was divided into two major categories viz nuclear and joint. Nuclear type was referred to the family composing of parents and their children only while joint family referred to the family including other persons related to them.

For the purpose, the relative scores were assigned as follows : -

Type of family	Scores
Nuclear	1
Joint	2

Status of family :-

It refers to the class to which the respondents belong. The score were assigned as follows :

[46]

Status		Score
Upper middle class	:	1
lower middle class	:	2

Total Income of the family : -

It refers to the amount of money earned by a person in a month. This variable was measured by recording total income per month of the family. This income was divided into four following categories.

Total family income / month (Rs.)	Scores
Below 10,000	1
10,000 - 15000	2
15000 - 20000	3
above 20000	4

Physical Activity:-

Here physical activity means the activity which increases requirement of calories for the body . The scores assigned were as follows :

Physical activity	Scores
Games	1
Exercise	2

Food advertisement :-

This refers to the television advertisements which affects the children eating behavior. The scores assigned were as follows :

Encouraged	Scores
Yes	1
No	2

Extra Meal :-

This means the food eaten between two meals . The scores assigned were as follows :

Intake	Scores
Yes	1
No	2

3.4.2. Dependent variables : -

Prevalence of obesity in 16-17 years old children of affluent society of Jhansi city was taken as dependent variable under different subheads :-

Obesity : -

Obesity is a state in which there in a generalized accumulation of excess adipose tissue in the body leading to more than 20 percent of the desirable weight.

The international cut off point for body mass index as used for classifying children as overweight and obese.

Body mass index : -

Some also refer to it as quetlet index. BMI uses a mathematical formula based on a person's height and weight BMI equals weight in kg divided by height in meters squared.

$$BMI = \frac{weight}{Height^2} \left(\frac{Kg}{M^2} \right)$$

The BMI can be compared with following ranges and scored were assigned as follows:

Below 20	-	underweight	1
20 - 25	-	Acceptable / Normal weight	2
25 - 30	-	Over weight	3
30 - 40	-	Obese	4
Above 40	-	Very obese.	5

Height :

Height in centimeters was marked on a wall in the school with the help of a measuring tape. All children were measured against the wall. The children were asked to remove the foot wear, and stand with heels together and head positioned so that the line of vision was perpendicular to the body. A glass scale was brought down to the topmost point. On the head height was recorded to the nearest I cm. It was calibrated against known height regularly. Zero error was checked for and removed if present everyday.

Weight :

A weighing scale was used. It was calibrated against known weight regularly. Zero error was checked and removed if present, every day. Clothes were not removed as adequate privacy was not available. However as the study period was in July, when the weather was warm, only light clothes were worn by the students. Weight was recorded to the nearest 500gm.

Triceps skin fold thickness(T.S.F.T) :

Harpendon's calipers were used for measuring T.S.F.T. The triceps skin fold is located at the back of the light upper arm midway between the acronrion and olecranon processes. or the subscapular skin fold in located just below the angle of the right scapula (shoulder and arm released). The fold was picked up in a line slightly included in the natural cleavage of the skin T.S.F.T. was measured upto an accuracy of 0.2 mm.

Middle upper arm circumference (M.U.A.C.) :

It gives an assessment of muscle mass, subcutaneous tissue and hence indirectly is a determinant of the nutritional status. It is taken on the left arm and measured at the midpoint of the upper arm. On the left hand, the mid point was marked by making central point of the distance between the olecrenon of the ulna and the acronion of the scapula, when the arm was fixed at the elbow. The circumference of the arm was measured by fiber glass tape and the reading taken to the nearest 0.1 cm.

[50]

3.5. Data Collection :

After selecting the sample and deciding the tools and techniques for data collection the schools were visited & semi structured - pre-tested questionnaire was administered to each child to collect data on socio demographic profile (age, sex, socio-economic status), dietary patterns and nutrient intake. Anthropometric measurements of weight, standing height, mid upper arm circumference (M.U.A.C.) and triceps skin fold thickness (T.S.F.T.), were measured by utilizing standard methodology.

Nutrient intake : -

Nutritional intake of the subject was determined by the weighment and actual analysis of composite diets.

Data were collected by paying personal visits to the respondents. Information on food consumption pattern was collected using 24 hours recall method. Standard measures including katories, spoons and glasses of standard size were shown to the respondents to facilitate them in estimating the amount of food consumed. Standard size utensils and detailed information about the ingredients used and the method of cooking was also recorded.

Amount of cooked food consumed was converted into raw equivalent with the help of standardized recipes. Food intake was recorded in terms of grams and milliliters.

3.6. Analysis of data :

Keeping in view the objectives of the study the data were subjected to statistical analyses. The collected data were scrutinized, coded, quantified , tabulated and compiled systematically. Appropriate statistical tools and tests were applied to draw inferences.

3.6.1 Percentage :

Simple percentage was calculated to understand the distribution of the profile of respondents, nutritional status of respondents and prevalence of obesity.

3.6.2 Mean :

The mean of scores of the respondents was calculated using the following formula :-

$$X = \sum_i \frac{X_i}{N} = \frac{\text{Sum of all values of the variable}}{\text{Number of observations}}$$

3.6.3 Paired t - test :

This was used to test the differences between pre and post intervention performance of experimental and control group.

$$t = \frac{\bar{d}}{S / \sqrt{n}}$$

$$\bar{d} = \frac{1}{n} \sum_{i=1}^{n} d_i \quad \text{and} \quad S^2 = \frac{1}{n-1} \sum_{i=1}^{n} (d_i - \bar{d})^2$$

$$d_i = x_i - y_i \quad \text{with n-1 df}$$

[52]

3.6.4 Chi Square Test:

Chi-square test was applied to establish the association between independent and dependent variables. The following standard formula was used:

$$\chi^2 = \sum_i \frac{(f - F)^2}{F}$$

Where , f is the observed frequency

F is the expected frequency.

3.6.5 Karl Pearson's Coefficient of Corelation

As a measure of intensity or degree of linear relationship between two variables, the following formula was used to calculate the coefficient of corelation :

$$r(x,y) = \frac{Cov.(x,y)}{\sigma x\ \sigma y} = \frac{\frac{1}{n} \sum (x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\frac{1}{n} \sum (x_i - \overline{x})^2 . \frac{1}{n} \sum (y_i - \overline{y})^2}}$$

[53]

Chapter - 4

Results & Discussion

RESULTS & DISCUSSION

TABLE - 1

Distribution of respondents according to their socio-personal variables

N=600

Personal	Boys		Girls	
	Upper	**Middle**	Upper	**Middle**
Age (Years)				
below 7	4 (2.66)	10 (6.65)	13 (8.66)	9 (6.0)
7 - 9	26 (17.33)	21 (14.0)	22 (14.66)	34 (22.66)
9 - 12	33 (22.0)	35 (23.33)	37 (24.66)	29 (19.33)
12 - 15	72 (48.0)	55 (36.66)	40 (26.66)	47 (31.33)
15 - 18	15 (10.0)	29 (19.33)	38 (25.33)	31 (20.66)
Education of Respondents (Standard)				
I -III	18 (12.0)	12 (8.0)	15 (10.0)	11 (7.33)
IV - VI	38 (25.33)	19 (12.66)	32 (21.33)	21 (14.0)
VII - IX	63 (42.0)	79 (52.66)	64 (42.66)	75 (50.0)
X - XII	31 (20.66)	40 (26.66)	39 (26.0)	43 (28.67)
Religion				
Hindu	131 (87.33)	127 (84.66)	121 (82.66)	114 (76.00)
Muslim	9 (6.00)	20 (13.33)	17 (11.33)	35 (23.33)
Sikh	8 (5.33)	3 (2.00)	7 (4.66)	1 (0.66)
Christian	2 (1.33)	-	5 (3.33)	-
Food Habits				
Vegetarians	9 (6.00	31 (20.66)	20 (13.33)	51 (34.00)
Non - Vegetarians	33 (22.00)	16 (10.66)	14 (9.33)	13 (8.66)
Eggetarians	97 (64.66)	80 (53.33)	101 (67.33)	61 (40.66)
Non Vegetarians (Occasionally)	11 (7.33)	23 (15.33)	15 (10.00)	25 (16.66)

Figures in parenthesis indicate percentage

N = Total no. of respondents

[54]

Fig. - 2A   Socio personnel variables of age & education.

Boys Upper Middle

20.66
8
12.66
42
25.33
52.66
12
26.66
26
14 7.33
42.66
50
21.33
28.67
10

Girls upper middle

Boys lower middle

Girls lower middle

□ I - III   ■ IV - VI   □ VII - IX   □ X - XII

Education

Boys Upper Middle

10
6.65
14
48
23.33
22
36.66
2.66
17.33
19.33
25.33
6
26.66
22.66
24.66
19.33
14.66
8.66
20.66
31.33

Girls upper middle

Boys lower middle

Girls lower middle

■ below 7   □ 7 - 9   ■ 9 - 12   ■ 12 - 15   □ 15- 18

Age
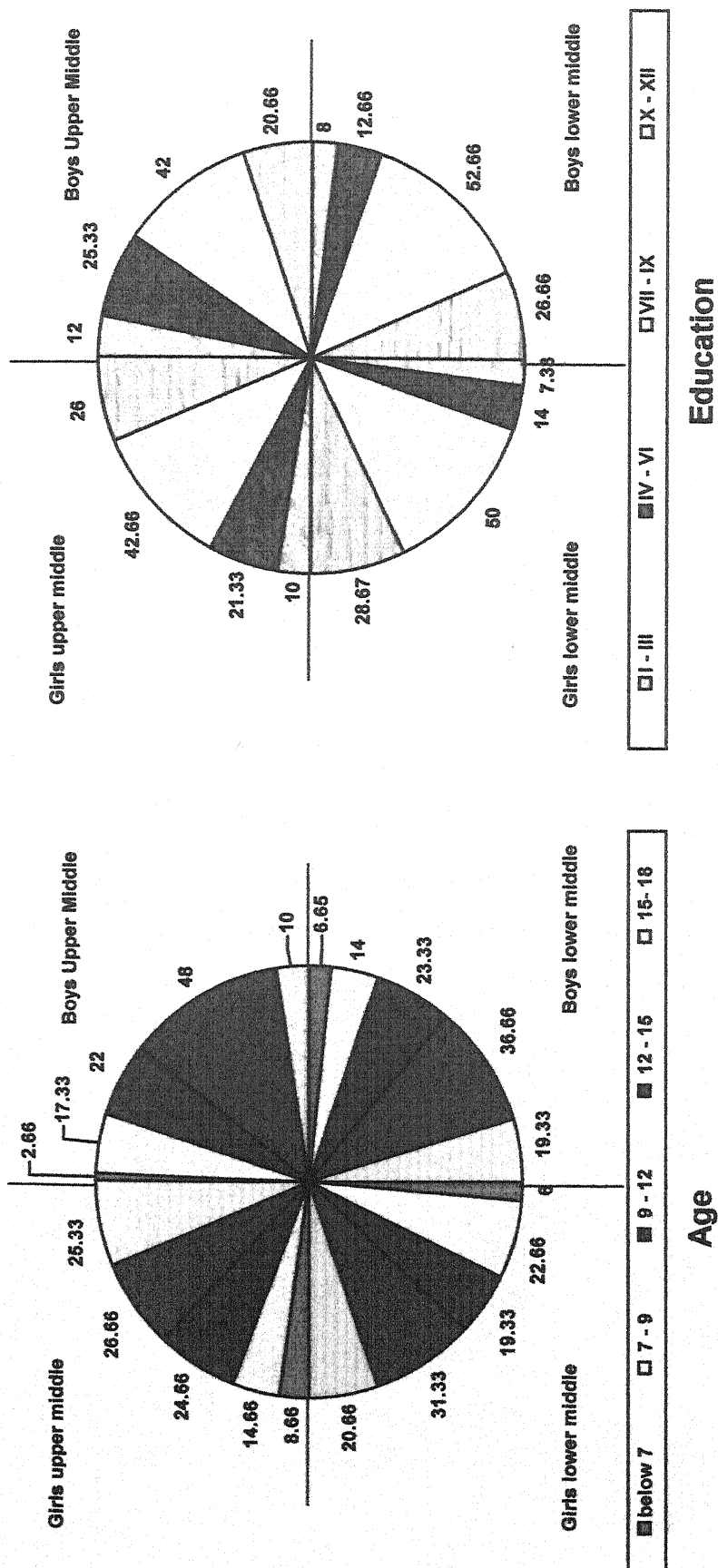
Fig. - 2B Socio Personnel variables of religion and food habits

Food habits pie chart with categories:
Boys Upper Middle, Girls upper middle, Boys lower middle, Girls lower middle

Values: 7.33, 20.66, 10.66, 64.66, 53.33, 22, 6, 10, 15.33, 34, 8.66, 40.66, 16.66, 13.33, 9.33, 67.33

Legend: Vegetarian, Non - Veg., Egg. Veg., Non. Veg. (Occ.)

Religion pie chart with categories:
Boys Upper Middle, Girls upper middle, Boys lower middle, Girls lower middle

Values: 6, 5.33, 1.33, 87.33, 84.66, 3.33, 4.33, 11.33, 13.33, 2, 0, 82.66, 0, 0.66, 23.33, 76

Legend: Hindu, Muslim, Sikh, Chrisstian

[56]

4.1 Respondents profile :

In this section percentage distribution of respondents according to their socio personal and family variables has been presented.

4.1.1 Socio personal variables of respondents

Regarding the socio personal variables of respondents, table 1 reveals that most of the boy respondents of upper middle class (48.0%) were in the age category of 12-15 years followed by 22.0 percent in 9-12 years and 17.33 percent in 7-9 years. Rest of the respondents (10.0% and 2.66%) were in the age category of 15-18 years and below 7 years respectively, while in lower middle class, most of the boy respondents (36.66%) were in the age category of 12-15 years followed by 23.33 percent and 19.33 percent in 9-12 years and 15-18 years, respectively. fourteen percent was in the 7-9 years and only 6.66 percent was in the age category of below 7 years.

Table 1 also shows that most of the girl respondents of the upper middle class i.e. 26.66 percent were in the age category of 12-15 years followed by 25.33 percent in 15-18 years and 24.66 percent in 9-12 years. Rest of the respondents (14.66% and 8.66%) were in the age category of 7-9 years and below 7 years, respectively, while in the lower middle class, most of the respondents (31.33%) were in the age category of 12-15 years followed by 22.66 percent in 7-9 years and 20.66 percent in 15-18 years. Only 6.0 percent were in the age category of below 7 years and 19.33 percent in 9-12 years.

[57]

Table 1 further shows that most of the boy respondents of upper middle class i.e. 42.0 percent were in the VII- IX standard followed by 25.33 percent in IV - VI standard and 20.66 percent in X-XII standard. Only 12.0 percent respondents were in the 1- III standard. In the boy respondents of lower middle class, 52.66 percent were in the VII- IX standard followed by 26.66 percent in X-XII standard and 12.66 percent in IV - VI standard. Only 8.0 percent in I-III standard. Similar trend of school standard was found for girl respondents of both classes

Regarding the religion of the girl respondents, 87.33 percent followed Hindu religion followed by Muslim (6.0%), Sikh (5.33%) and Christian (1.33%) religion, while in boy respondents of lower middle class, most of the respondent i.e.- 84-66 percent were belonged to Hindu religion followed by (13.33%) Muslim and (2.0%) Sikh. None of the respondents were Christian. Similar trend of religion was found for girl respondents of both classes.

The food habits of the respondents showed that most of the boy respondents of upper middle class i.e.- 64.66 percent belonged to the category of egg vegetarians followed by 22.0 percent non-vegetarian and 7.33 percent non -vegetarian (occasionally). Only 6.0 percent respondents were vegetarians. In the boy respondents of lower middle class, 53.33 percent respondents were eggetarian, whereas 20.66 percent and 15.33 percent respondents were vegetarian and non-vegetarian (occasionally) respectively. Rest of the respondents (10.66%) were non-vegetarian. Similar trend was found in girls of both classes. (Fig. 2A , 2B)

[58]

TABLE - 2

Distribution of respondents according to their family variables

N=600

Family variables	Boys		Girls	
	Upper-middle	lower-middle	Upper-middle	lower-middle
Education of Parents				
Illiterate	-	-	-	-
Primary	-	-	-	-
Middle	-	-	-	-
High School	17 (11.33)	13 (8.66)	7 (4.66)	15 (10.0)
Intermediate	12 (8.0)	18 (12.0)	5 (3.33)	17 (11.33)
Graduation	76 (50.66)	90 (60.0)	106 (70.66)	99 (66.)
Post Graduate	45 (30.0)	29 (19.33)	32 (21.33)	19 (12.66)
Occupation				
Business	75 (50.0)	59 (39.33)	70 (46.66)	61 (40.66)
Service	55 (36.66)	82 (54.66)	61 (40.66)	65 (43.33)
Agriculture	-	2 (1.33)	3 (2.0)	9 (6.0)
Any Other	20 (13.33)	7 (4.66)	16 (10.66)	15 (10.0)
Type of family				
Joint	59 (39.33)	68 (45.33)	66 (44.0)	42 (28.0)
Nuclear	91 (60.67)	82 (54.67)	84 (56.0)	108 (72.0
Family Income (Rs.)				
Below 10,000	1 (0.66)	29 (19.33)	2 (1.33)	31 (20.66)
10000 – 15000	15 (10.0)	70 (46.66)	22 (14.66)	82 (54.66)
15000 – 20000	84 (56.0)	36 (24.0)	87 (58.0)	26 (17.33)
Above 20000	50 (33.33)	15 (10.0)	39 (26.0)	11 (7.33)

Figures in parenthesis indicate percentage

N = Total no. of respondents

Fig. 3A : Family variables of parents education & occupation

Boys Upper Middle

Boys lower middle

Girls upper middle

Girls lower
middle

13.33
0
36.66
50
10.66
2
40.66
46.66
10
6
43.33
40.66
4.66
1.33
54.66
39.33

Occupation

Business Service Agriculture Any other

Boys Upper Middle

Boys lower middle

Girls upper middle

Girls lower middle

8.66
30
12
50.66
60
11.33
8
19.33
21.33
10
11.33
70.66
66
3.33
4.66
12.66

Parents Education

High School Intermediate Graduation Post. Grad.

[60]

Fig. 3B : Family variables of type of family & family income.

Boys Upper Middle

Boys lower middle

Girls upper middle

Girls lower middle

19.33
33.33
56
10
0.66
26
58
14.66
1.33
7.33
17.33
54.66
20.66
10
24
46.66

□ Below Rs. 10000   ■ Rs. 10000-15000   □ Rs. 15000-20000   □ Above Rs. 20000

Family Income

Boys Upper Middle

Boys lower middle

Girls upper middle

Girls lower middle

60.67
39.33
56
44
72
54.67
28
45.33

□ Joint   ■ Nuclear

Type of Family

[61]
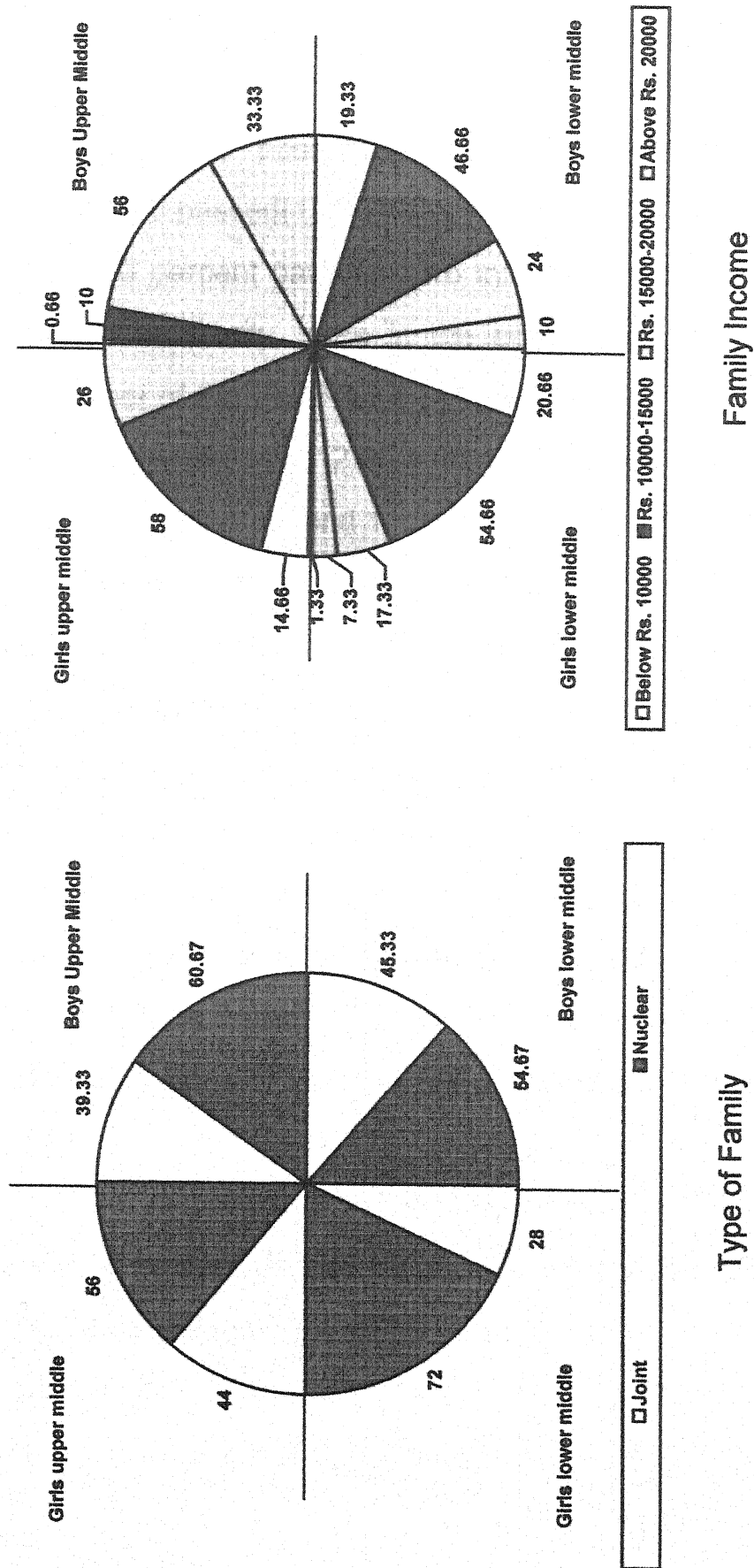
4.1.2 Family variables of respondents

Table2 gives the family profile of the children respondents. Regarding the education of parents, it was revealed that most of the parents of both sexes i.e. 50.66 percent and 70.66 percent were graduates followed by post graduates (30.0 percent and 21.33 percent) and Metric passed(13.33 percent and 4.66 percent) . Only 8.0 percent and 3.33 percent parents were intermediate in both sexes of upper middle class family, while in the both sexes of lower middle class family, most of the parents i.e.- 60 percent and 66 percent were graduates.19.33 percent and 12.66 percent were post graduates. Rest of the parent's (12.0 percent and 11.33 percent) and (8.66 percent and 10 percent) were intermediates and metric passed, respectively.

Regarding the occupation of the father , it was revealed that about half of the father respondents of both sexes (50 percent boys and 46.66 percent girls) were engaged in business in upper middle class family followed by 36.66 percent boys respondents and 40.66 percent girl father respondents in service and 13.33 percent boy respondent and 10.66 percent girl father respondents were in any other profession. Only 2 percent girl father respondents were engaged in agriculture while none of the boys father respondents were engaged in agriculture.

The father respondents of both sexes in lower middle class family i.e.-54.66 percent and 43.33 percent were engaged in service followed by 39.33 percent and 40.66 percent father in business, and 4.66 percent and 10.0 percent in any other profession. Rest of

[62]

respondents (1.33 percent and 6.0 percent-) were engaged in agriculture.

Regarding family type, 60.67 percent boy respondents and 56.0 percent girl respondents of upper middle class family belonged to nuclear family and 39.33 percent boy respondents and 44.0 percent girl respondents belonged to joint family .While in the lower middle class family, 54.67 percent boy respondents and 72.0 percent girl respondents belonged to nuclear family and 45.33 percent boy respondents and 28.0 percent girl respondents belonged to joint family

Table 2 further shows that in the upper middle class family, 56 percent boy respondents and 58 percent girl respondents had family income ranging between Rs. 15,000- 20,000 followed by 33.33 percent boy respondents and 26 percent girl respondents above Rs. 20,000, and 10 percent boy respondents and 14.66 girl respondents in Rs. 10,000 - 15,000. Rest of the respondents had family income (boys - 0.66 percent and girls 1.33 percent) below Rs. 10,000. While in the lower middle class family, 46.66 percent boy respondents and 54.66 percent girl respondents had family income ranging between Rs.10,000 - 15,000 followed by 24 percent boy respondents and 17.33 percent girl respondents between Rs.15,000-20,000 and 19.33 percent boy respondents and 20.66 girl respondents below Rs. 10,000 .Only 10 percent boy respondents and 7.33 percent girl respondents had family income above Rs. 20,000. (Fig. 3A,3B)

TABLE - 3

Distribution of respondents according to nutritional status

N=600

Age (Years)	n	Under weight	Normal weight	Over weight	Obese
below 7	36	2 (5.55)	26 (72.2)	7 (19.4)	1 (2.77)
7 - 9	103	7 (6.8)	71 (68.9)	17 (16.5)	8 (7.77)
9- 12	134	8 (5.97)	95 (70.99)	22 (16.41)	9 (6.72)
12 - 15	214	18 (8.41)	143 (66.8)	47 (21.96)	6 (2.8)
15 - 18	113	6 (5.3)	85 (75.22)	18 (15.93)	4 (3.54)
Total	600	41	420	111	28
Percentage		6.8	70	18.5	4.7

Figures in parenthesis indicate percentage
N = Total no. of respondents

Fig.4 Nutritional Status of respondents.

Age (years)

Respondents (%)

□ Under Weight ■ Normal Weight ■ Over Weight □ Obese

Below 7   7 - 9   9 - 12   12 - 15   15 - 18

[65]
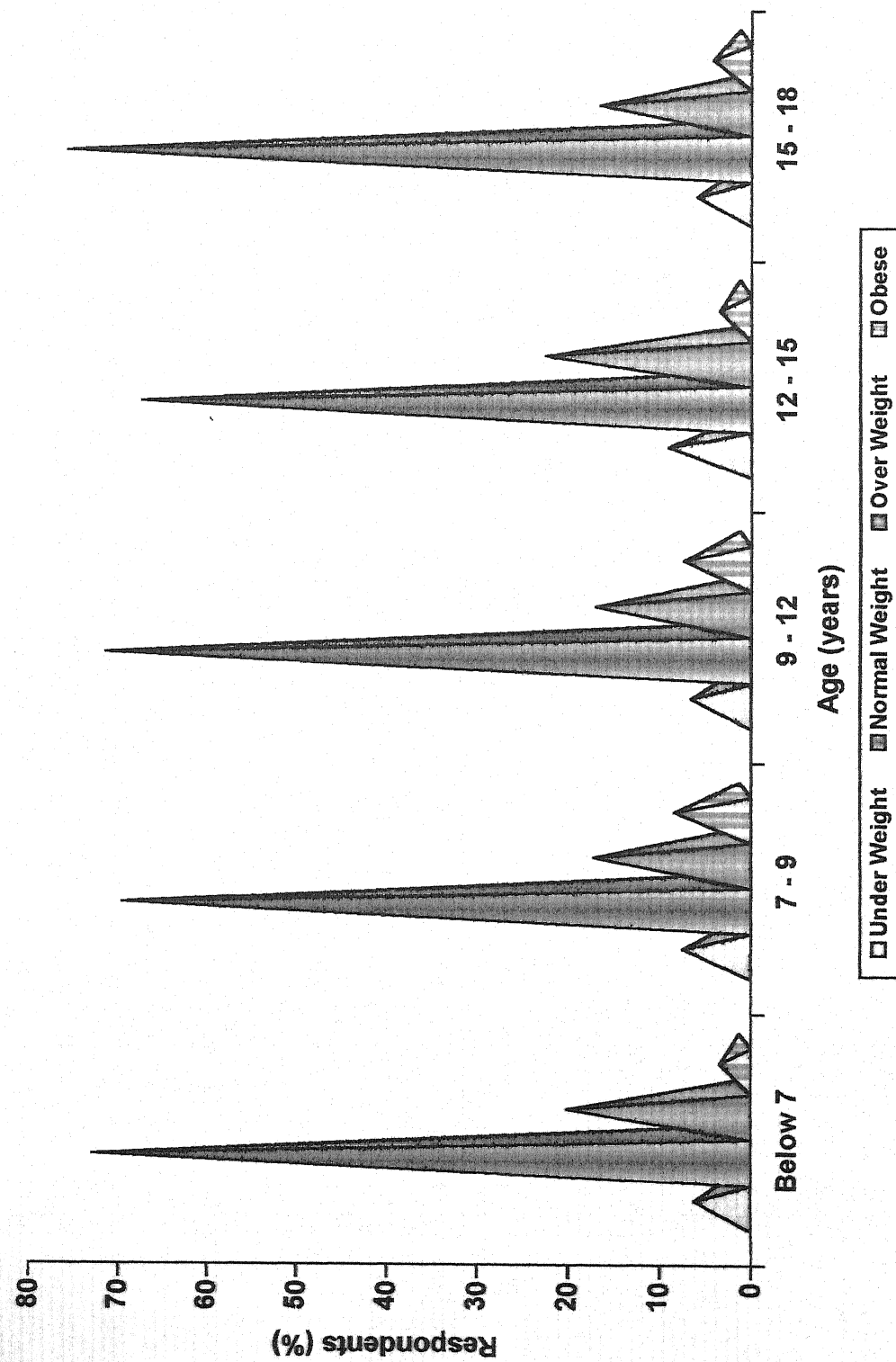
4.2 Nutritional status of respondents of Jhansi city.

Data in table 3 shows that most respondents (72.2%) of below 7 years age group were normal followed by overweight (19.4%), under weight (5.55%) and obese (2.77%). Similar trend was seen in respondents of 12-15 years and 15-18 years age group; while concerning 7-9 years age group, (68.9%) respondents were normal followed by over weight (16.5%), obese (7.77%) and under weight (6.8%). Similar trend was found in respondents of 9-12 years age group (Fig. 4).

TABLE - 4

Distribution of respondents of upper-middle & lower- middle class according to nutritional status

N=6000

Age (Years)	Upper Middle					Lower Middle				
	n	Under weight	Normal weight	Over weight	Obese	n	Under weight	Normal weight	Over weight	Obese
Below 7	17	1 (5.88)	11 (64.7)	4 (23.52)	1 (5.88)	19	1 (5.26)	15 (78.94)	3 (15.78)	-
7 - 9	48	3 (6.25)	33 (68.75)	7 (14.58)	5 (10.41)	55	4 (7.27)	38 (69.09)	10 (18.18)	3 (5.45)
9 - 12	70	7 (10)	45 (64.28)	13 (18.57)	5 (7.14)	64	1 (1.56)	50 (78.12)	9 (14.06)	4 (6.25)
12 - 15	112	11 (9.82)	67 (59.82)	29 (25.89)	5 (4.46)	102	7 (6.86)	76 (74.50)	18 (17.64)	1 (.98)
15 - 18	53	3 (5.66)	37 (69.81)	11 (20.75)	2 (3.77)	60	3 (5.0)	48 (80)	7 (11.66)	2 (3.33)
Total	300	25	193	64	18	300	16	227	47	10
Percentage		8.33	64.33	21.38	6.0		5.33	75.66	15.66	3.33

Figures in parenthesis indicate percentage
N = total no. of respondents

[67]

Fig. 5 : Nutritional status of respondents of upper middle & lower middle class.

4.2.1 Distribution of respondent of upper middle class & lower middle class according to nutritional status .

Data in table 4 reveals that normal weight respondents of below 7 years age group were more in lower middle class (78.94%) than in upper middle class family (64.7%), while over weight respondents were more in upper middle class (23.52%) than in lower middle class family (15.78%). Underweight respondents were identical in both classes (i.e. 5.88% and 5.26%) and obese respondents were found only in upper middle class family (5.88%). Concerning 7-9 years age group, underweight, normal weight and overweight respondents were more in lower middle class (7.27%, 69.09% and 18.18%) than in upper middle class family (6.25%, 68.75% and 14.58%), while obese respondents were more in upper middle class (10.41%) than in lower middle class family (5.45%).

Data further shows that, underweight, overweight and obese respondents of 9-12 years age group were more in upper middle class (10% , 18.57% and 7.14%) than in lower middle class family (i.e. 1.56%, 14.06% and 6.25%); but normal weight respondents were more in lower middle class (78.12%) than in upper middle class family(64.28%). Similar trend was found for respondents of 12-15 years age group and 16-17 years age group. (Fig.5)

TABLE - 5

Distribution of girls of upper-middle & lower-middle class according to nutritional status

N=300

Age (Years)	n	Upper Middle				n	Lower Middle			
		Under weight	Normal weight	Over weight	Obese		Under weight	Normal weight	Over weight	Obese
Below 7	13	1 (7.69)	8 (61.53)	3 (23.07)	1 (7.69)	9	-	8 (88.89)	1 (11.11)	-
7 - 9	22	2 (9.09)	15 (68.18)	2 (9.09)	3 (13.63)	34	1 (2.94)	24 (70.58)	7 (20.58)	2 (5.88)
9 - 12	37	5 (13.51)	22 (59.45)	7 (18.91)	3 (8.10)	29	-	22 (75.86)	5 (17.24)	2 (6.89)
12 - 15	40	6 (15.0)	20 (50.0)	13 (32.5)	1 (2.5)	47	4 (8.51)	33 (70.21)	10 (21.27)	-
15 - 18	53	3 (7.89)	24 (63.15)	9 (23.68)	2 (5.26)	31	2 (6.4)	24 (77.41)	4 (12.9)	1 (3.22)
Total	150	17	89	34	10	150	7	111	27	5
Percentage		11.33	59.33	22.66	6.66		4.66	74.0	18.0	3.33

Figures in parenthesis indicate percentage
N = total no. of respondents

Fig. 6 : Nutritional status of girls of both groups

Age (Years)

Respondents (%)

UPPER MIDDLE

LOWER MIDDLE

Below 7   7 - 9   9-12   12 - 15   15 -18   Below 7   7 - 9   9 - 12   12 - 15   15 - 18

■ Under Weight   ■ Normal Weight   ■ Over Weight   □ Obese

[71]
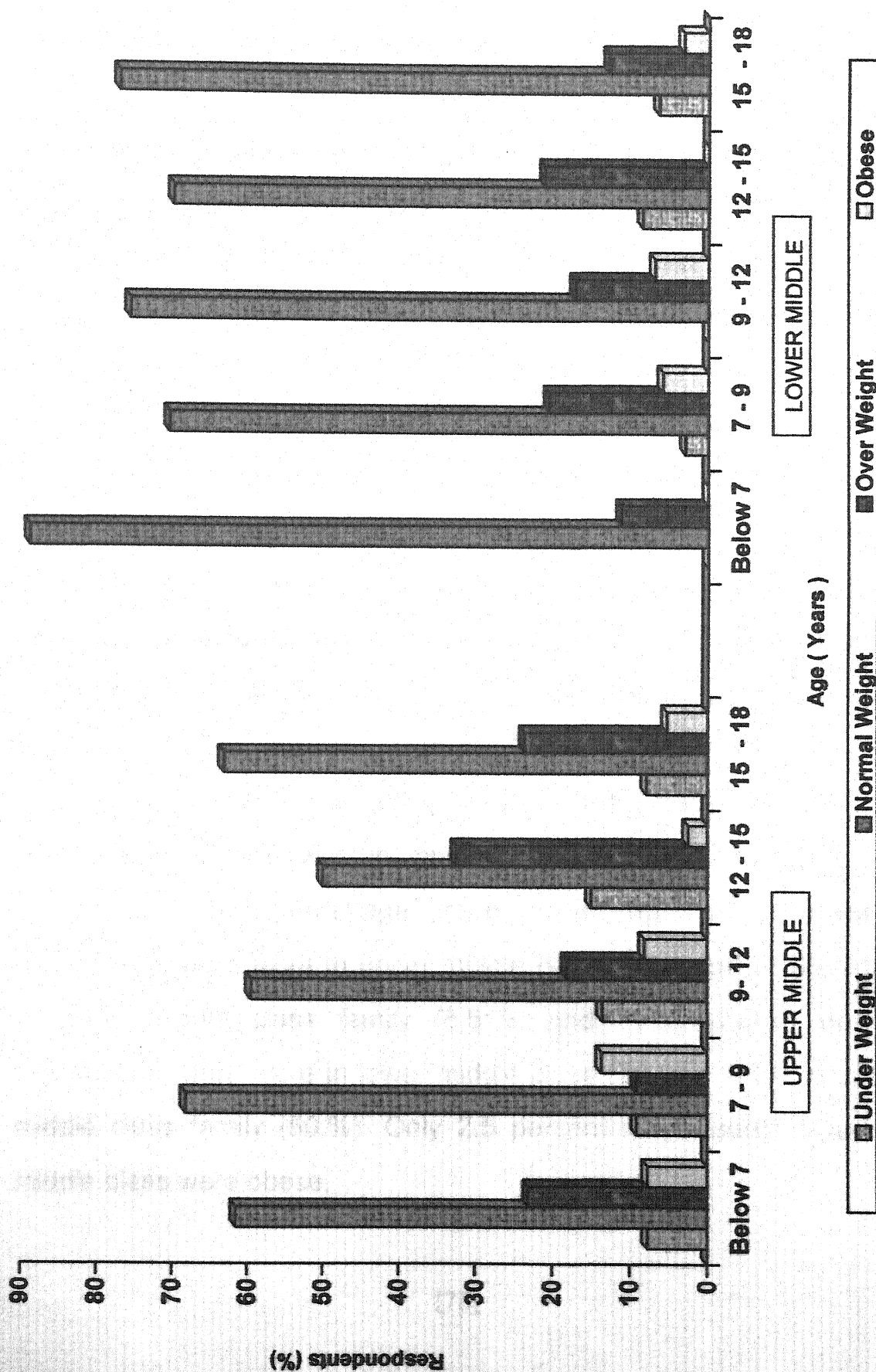
4.2.2   Nutritional status of girls of both groups.

Data in table 5 shows   that normal weight respondents of below 7 years age group were more in lower middle class family (88.89%) than in upper middle class family (61.53%). Conversely over weight respondents were more in upper middle class family (23.07%) than in lower middle class family (11.11%). Under weight (7.69%) and obese respondents (7.69%) were found in upper middle class family.

In the 7-9 years age group, under weight and obese respondents were more in upper middle class family (9.09% and 13.63%) than in lower middle class family (2.94% and 5.88%); while normal and over weight respondents were more in lower middle class (70.58% and 20.58%) than in upper middle class family (68.18% and 9.09%).

Data further shows that, normal weight respondents of 9-12 years age group were more in lower middle class (75.86%) than in upper middle class family (59.45%). But overweight and obese respondents were more in upper middle class (18.91% and 8.10%) than in lower middle class family (17.24% and 6.89%).Under weight respondents (13.51%) were in upper middle class family.

In the 12-15 years age group, under weight and overweight respondents were more in upper middle class (15% and 32.5%) than in lower middle class family (8.51% and 21.27%);while normal respondents were more in lower middle class (70.21%) than in upper middle class family (50.%). Only 2.5 percent respondents of upper middle class were obese.

[72]

Underweight , overweight and obese respondents of 15-18 years age group were more in upper middle class family (7.89%, 23.68% and 5.26%) than in lower middle class family (6.45%, 12.9% and 3.22%). Normal weight respondents were more in lower middle class (77.41%) than in upper middle class family (63.15%).(Fig. 6)
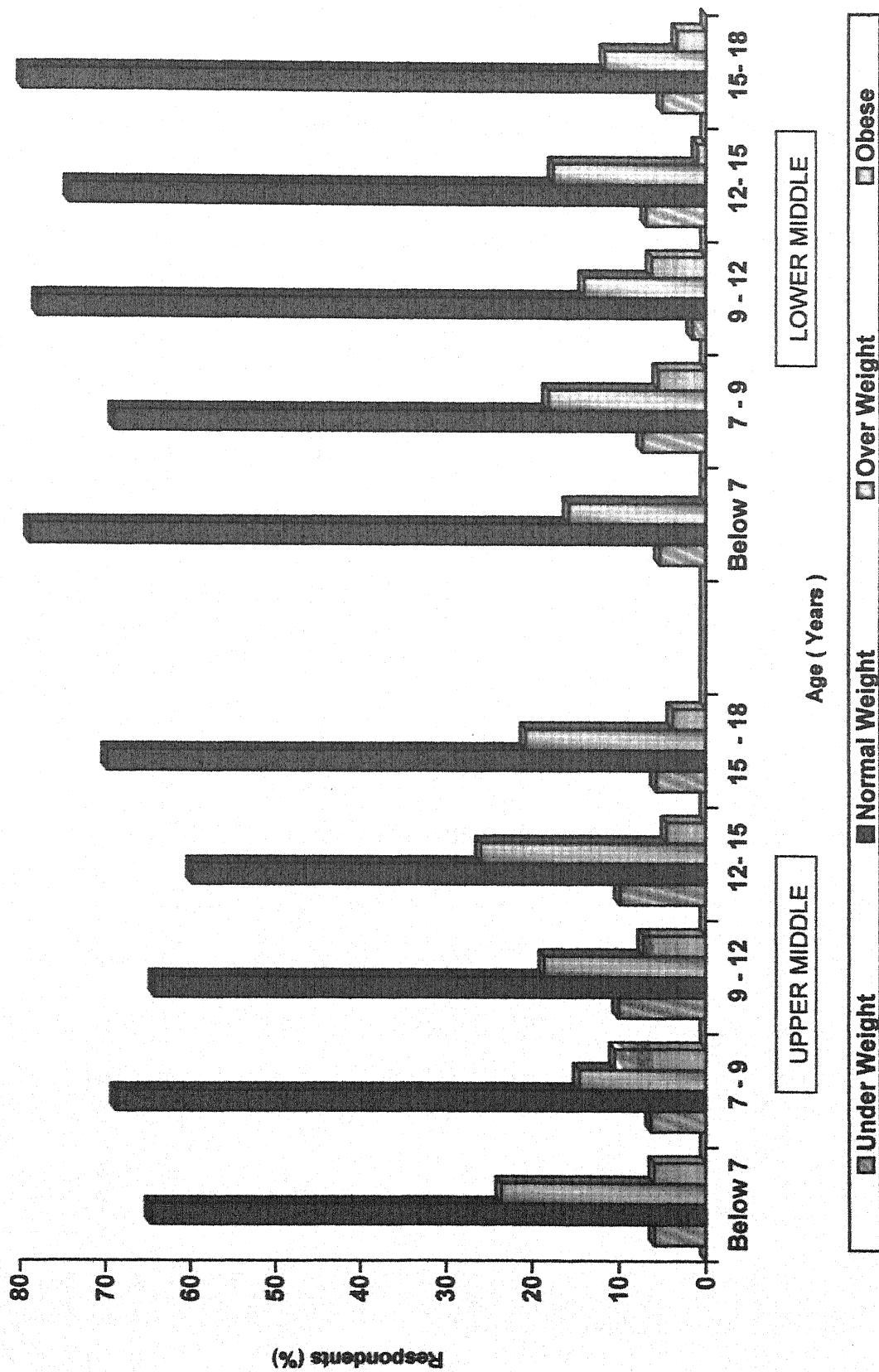
TABLE - 6

Distribution of boys of upper -middle & lower- middle class according nutritional status

N=300

Age (Years)	Upper Middle					Lower Middle				
	n	Under weight	Normal weight	Over weight	Obese	n	Under weight	Normal weight	Over weight	Obese
Below 7	4	- -	3 (75.0)	1 (25.0)	- -	10	1 (10.0)	7 (70.0)	2 (20.0)	- -
7 - 9	26	1 (3.84)	18 (69.23)	5 (19.23)	2 (7.69)	21	3 (14.28)	14 (66.66)	3 (14.28)	1 (4.76)
9 - 12	33	2 (6.06)	23 (69.69)	6 (18.18)	2 (6.06)	35	1 (2.85)	28 (80.0)	4 (11.42)	2 (5.71)
12 - 15	72	5 (6.94)	47 (65.27)	16 (22.22)	4 (5.55)	55	3 (5.45)	43 (78.18)	8 (14.54)	1 (1.81)
15 - 18	15	-	13 (86.66)	2 (13.33)	- -	29	1 (3.44)	24 (82.75)	3 (10.34)	1 (3.44)
Total	150	8	104	30	8	150	9	116	20	5
Percentage		5.33	69.33	20	5.33		6.0	77.33	13.33	3.33

Figure in parenthesis indicate percentage
N = total no. of respondents

[74]

Fig. 7 : Nutritional status of boys of both groups.

[75]
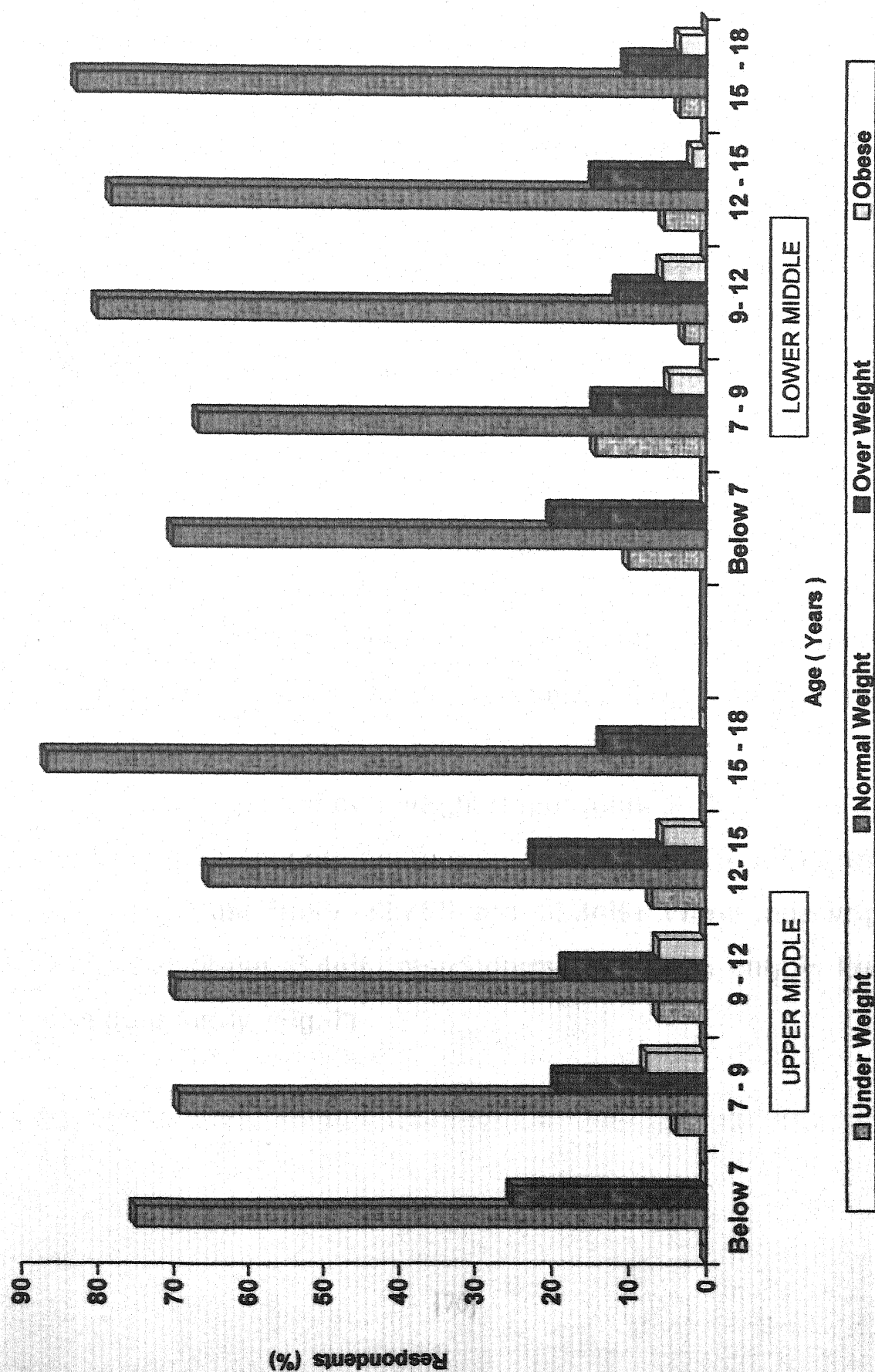
4.2.3 Nutritional status of boys of both groups.

Data in table 5 reports that normal and overweight respondents of below 7 years age group were more in upper middle class (75% and 25%) than in lower middle class family (70% and 20%). While under weight respondents were found in lower middle class family (10%).

In the 7-9 years age group, underweight respondents were more in lower middle class family (14.28%) than in upper middle class family (3.84%), conversely normal, overweight and obese respondents were more in upper middle class family (69.23% , 19.23% and 7.69%) than in over middle class family (66.66%, 14.28% and 4.76%). Data further shows that, underweight, over weight and obese respondents of 9-12 years age group were more in upper middle class (6.06%, 18.18% and 6.06%) than in lower middle class family (2.85%, 11.42% and 5.71%) ,while normal respondents were more in lower middle class (80%) than in upper middle class family (69.69%).Similar trend was also seen in respondents of 12-15 years age group.

Normal weight and over weight respondents of 15-18 years age group were more in upper middle class (86.66% and 13.33%) than in lower middle class family (82.75% and 10.34%). While underweight (3.44%) and obese (3.44%) respondents were seen only in lower middle class family. (Fig. 7)

TABLE - 7

Distribution of respondents according to the calories intake

Age (Years)		Calories (kcal)							
		Upper middle				lower Middle			
		1000-1500	1500-2000	2000-2500	2500-3000	1000-1500	1500-2000	2000-2500	2500-3000
Below 7	G	7 (53.85)	6 (46.15)	-	-	6 (66.67)	3 (33.33)		
	B	2 (50.0)	2 (50.0)	-		8 (80.0)	2 (20.0)		
7 - 9	G	12 (54.55)	10 (45.45)	-		13 (38.24)	13 (38.24)	8 (23.52)	
	B	5 (19.23)	19 (73.07)	2 (7.69)		8 (38.09)	13 (61.9)		
9 - 12	G	8 (21.62)	24 (64.86)	5 (13.51)		10 (34.48)	15 (51.72)	4 (13.79)	
	B	4 (12.12)	23 (69.69)	6 (18.18)		7 (20.0)	22 (62.86)	6 (17.14)	
12 - 15	G	7 (17.5)	24 (60.0)	9 (22.5)		8 (17.02)	34 (72.34)	5 (10.63)	
	B	2 (2.78)	26 (36.11)	38 (52.78)	6 (8.33)	4 (7.27)	21 (38.18)	28 (50.9)	2 (3.64)
15 - 18	G	5 (13.16)	24 (63.16)	8 (21.05)	1 (2.63)	7 (22.58)	17 (54.84)	7 (22.58)	
	B	-	2 (13.33)	11 (73.33)	2 (13.33)	1 (3.45)	4 (13.79)	17 (58.62)	7 (24.13)

Figures in parenthesis indicate percentage   G - Girl   B - Boy

N = total no. of respondents

[77]

FIG. 8A : Calories (kcal.) intake of Girls.

[78]
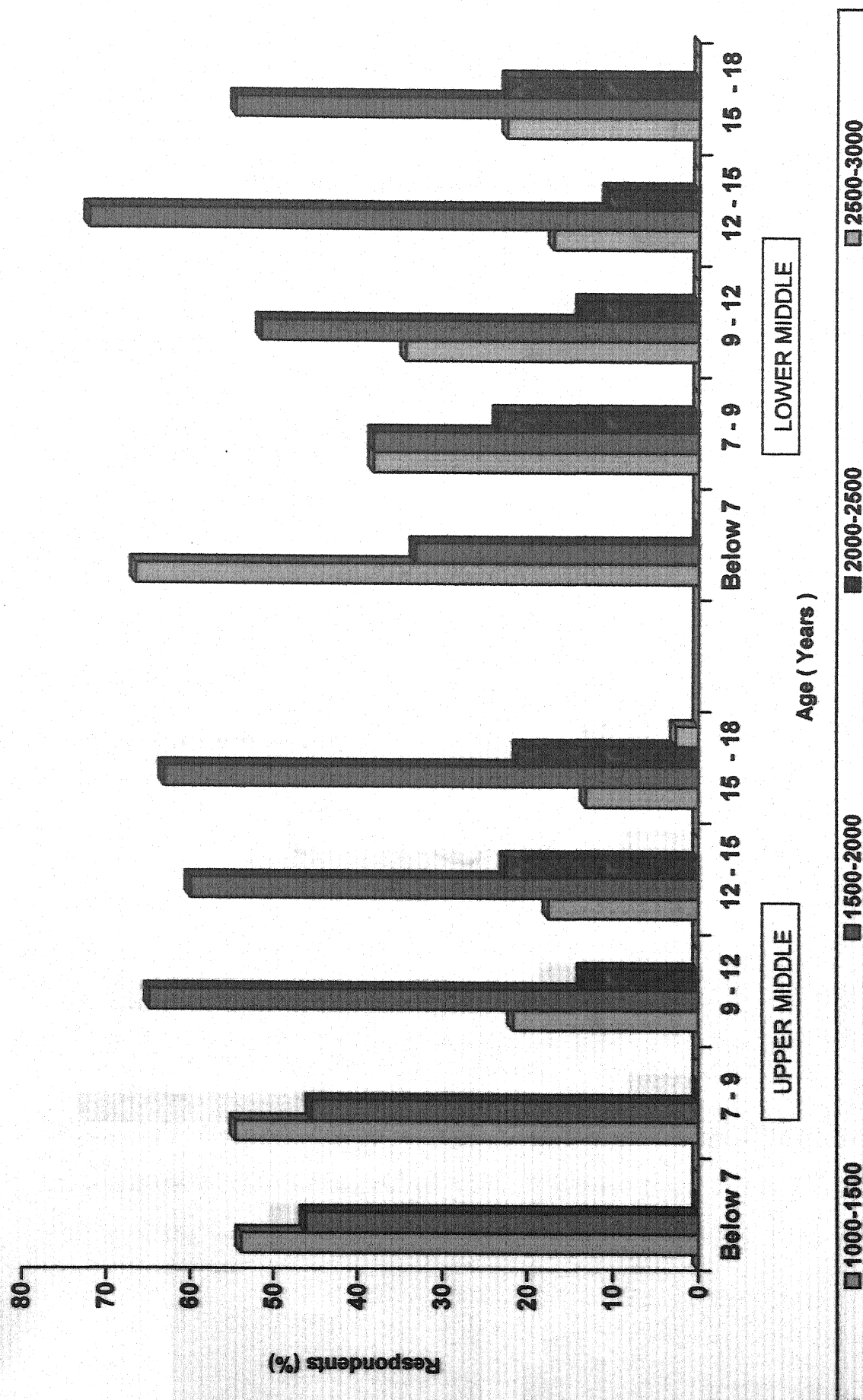
FIG. 8B : Calories (kcal.) intake of boys.

Respondents (%)

Age (Years)

UPPER MIDDLE

LOWER MIDDLE

■ 1000-1500   ■ 1500-2000   ■ 2000-2500   ■ 2500-3000

[79]
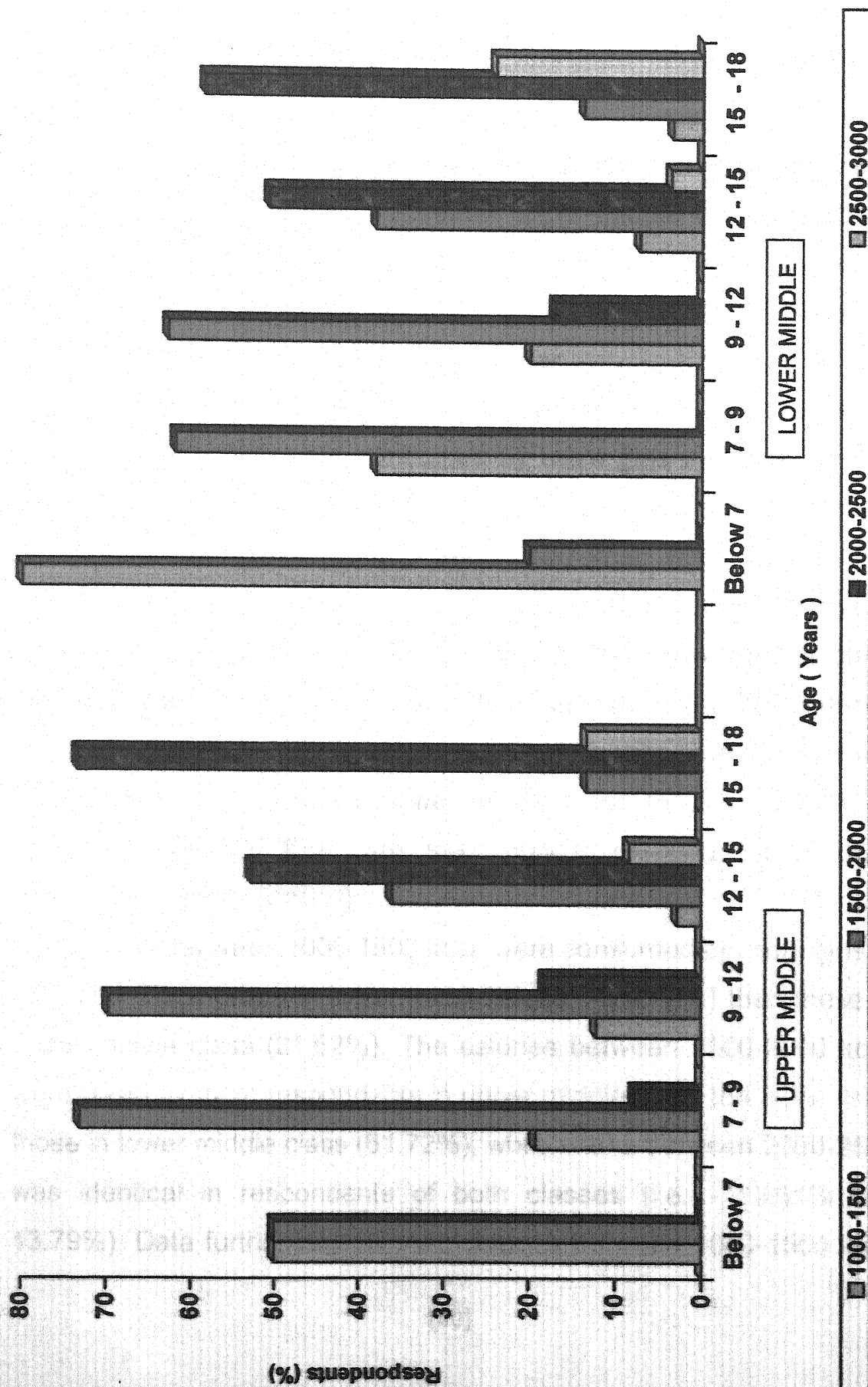
4.3   Nutrient Intake

4.3.1   Daily Intake of calories in respondents of upper middle and lower middle class

Table 7 indicates that in the age group below 7 years, the calories between 1000 - 1500 kcal. were consumed by more girls in lower middle class (66.67%) than those in upper middle class (53.85%), while calories between 1500-2000 kcal. were taken by more respondents in upper middle class (46.15%) than in lower middle class (33.33%). In the boys , the trend was similar.

in the 7-9 years age group, the calories between 1000-1500 kcal. and 1500-2000 kcal. were consumed by more girls in upper middle class family (54.55% and 45.45%) than those in lower middle class (34.24%).   The intake between 2000-2500 kcal. was seen only in middle class family respondents (23.52%). The calories between 1000-1500 Kcal. were consumed by more boys in lower middle class (38.09%) than those in upper middle class (19.23%). The calories between 1500-2000 kcal. were taken by more respondents in upper middle class (73.07) than in lower middle class (61.9%), but intake between 2000-2500 kcal. was seen only in respondents of lower middle class family (7.69%)

The calories between 1000-1500 kcal. were consumed by more girls of 9-12 years age group in lower middle class   (34.48%) than those in upper middle class (21.62%). The calories between 1500-2000 kcal. were taken by more respondents in upper middle class (64.86%) than those in lower middle class (51.72%), while intake between 2000-2500 was identical in respondents of both classes (i.e. - 13.51% and 13.79%). Data further reveals that, calories between 1000-1500 kcal.

[80]

were consumed by more boys in lower middle class (20.0%) than those in upper middle class family (12.12%),while calories between 1500-2000 kcal. and 2000- 2500 kcal. were consumed by more boys in upper middle class (69.69% and18.18%) than those in lower middle class family (62.86% and 17.14%) .

Data on consumption pattern of calories indicates that, the calories intake between 1000-1500 kcal. in girls of age group 12-15 years was almost same in both family classes (17.51% and 17.02%). The calories between 1500-2000 kcal. were consumed by more respondents in lower middle class (72.34%) than those in upper middle class family (60.0%), but calories between 2000-2500 kcal. were taken by more girls in upper middle class (22.5%) than those in lower middle class family (10.63%). In the boy respondents, the calories between 1000-1500 kcal. and 1500-2000 kcal. were consumed by more boys in lower middle class(7.27%and 38.17%) than those in upper middle class (36.11% and 2.78%),while calories between 2000-2500 and 2500-3000 kcal. were consumed by more respondents in upper middle class (52.78% and 8.33%) than those in lower middle class family (50.9% and 3.64%).

Results further show that in the 15-18 years age group, calories between 1000-1500 kcal. and 2000-2500 kcal. were consumed by more girls in lower middle class (22.55% respectively) than those in upper middle class (13.16% and 21.05%) . The calories between 1500-2000 kcal. were consumed by more respondents in upper middle class (63.16%) than those in lower middle class (54.84%). Only 2.63% respondents of upper class were taking calories between 2500-3000 kcal. , while in the boys, intake between 1500-2000 kcal. was identical in respondents of both family classes (13.33% and 13.79%).

[81]

The calories between 2000-2500 kcal. were consumed by more boys in upper middle class (73.33%) than those in lower middle class family (58.62%). Conversely calories between 2500-3000 kcal. were taken by more respondents in lower middle class (24.13%) than in upper middle class family (13.33%). The calories intake between 1000 -1500 kcal. was seen only in lower middle class respondents (3.45%). (Fig.8A,8B)

TABLE - 8

Distribution of respondents according to the protein intake

N=600

Age (Years)		Protein (gm)							
		Upper middle				Lower Middle			
		Below 30	30 - 50	50 - 70	70 - 90	Below 30	30 - 50	50 - 70	70 - 90
Below 7	G	9 (69.23)	4 (30.74)			5 (55.56)	4 (44.44)		
	B	3 (75.0)	1 (25.0)			7 (70.0)	3 (30.30)		
7 - 9	G	6 (27.27)	14 (63.63)	2 (9.09)		10 (29.41)	21 (61.76)	3 (8.82)	
	B	4 (15.38)	18 (69.23)	4 (15.38)		3 (14.28)	12 (57.14)	6 (28.57)	
9 - 12	G	3 (8.11)	25 (67.57)	9 (24.32)		1 (3.45)	18 (62.07)	10 (34.48)	
	B	7 (21.21)	15 (45.45)	10 (30.30)	1 (3.03)	3 (8.57)	17 (48.57)	14 (40.0)	1 (2.86)
12 - 15	G	1 (2.5)	19 (47.5)	18 (45)	2 (5)	2 (4.26)	11 (23.4)	27 (57.45)	7 (14.89)
	B	7 (9.72)	16 (22.22)	38 (52.78)	11 (15.28)	8 (14.54)	22 (40.0)	21 (31.18)	4 (7.27)
15 - 18	G	2 (5.26)	17 (44.74)	15 (39.47)	4 (10.53)	2 (6.45)	6 (19.35)	22 (70.97)	1 (3.23)
	B	-	2 (13.33)	7 (46.67)	6 (40.0)	-	5 (17.24)	16 (55.17)	8 (27.59)

Figures in parenthesis indicate percentage

N = total no. of respondents   G - Girl   B -Boy

[83]

FIG. 9A : Intake of Protein (gm) in girls

Respondents (%)

Age (Years)

UPPER MIDDLE

LOWER MIDDLE

□ BELOW 30   ■ 30 - 50   □ 50 - 70   □ 70 - 90

[84]
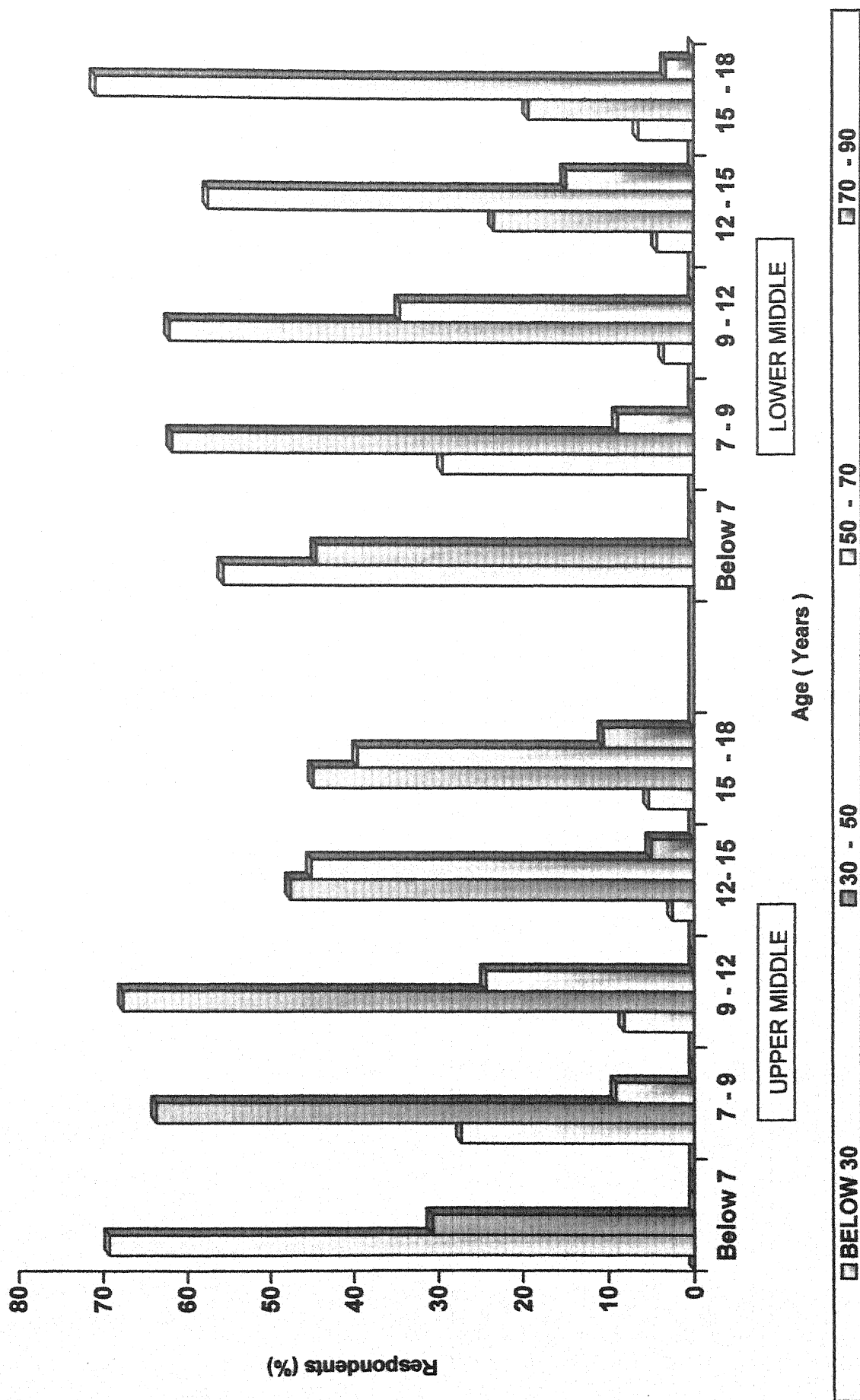
FIG. 9B : Intake of Protein (gm) in boys.

Age (Years)

Respondents (%)

UPPER MIDDLE

LOWER MIDDLE

☐BELOW 30   ☐30 - 50   ☐50 - 70   ☐70 - 90

[85]
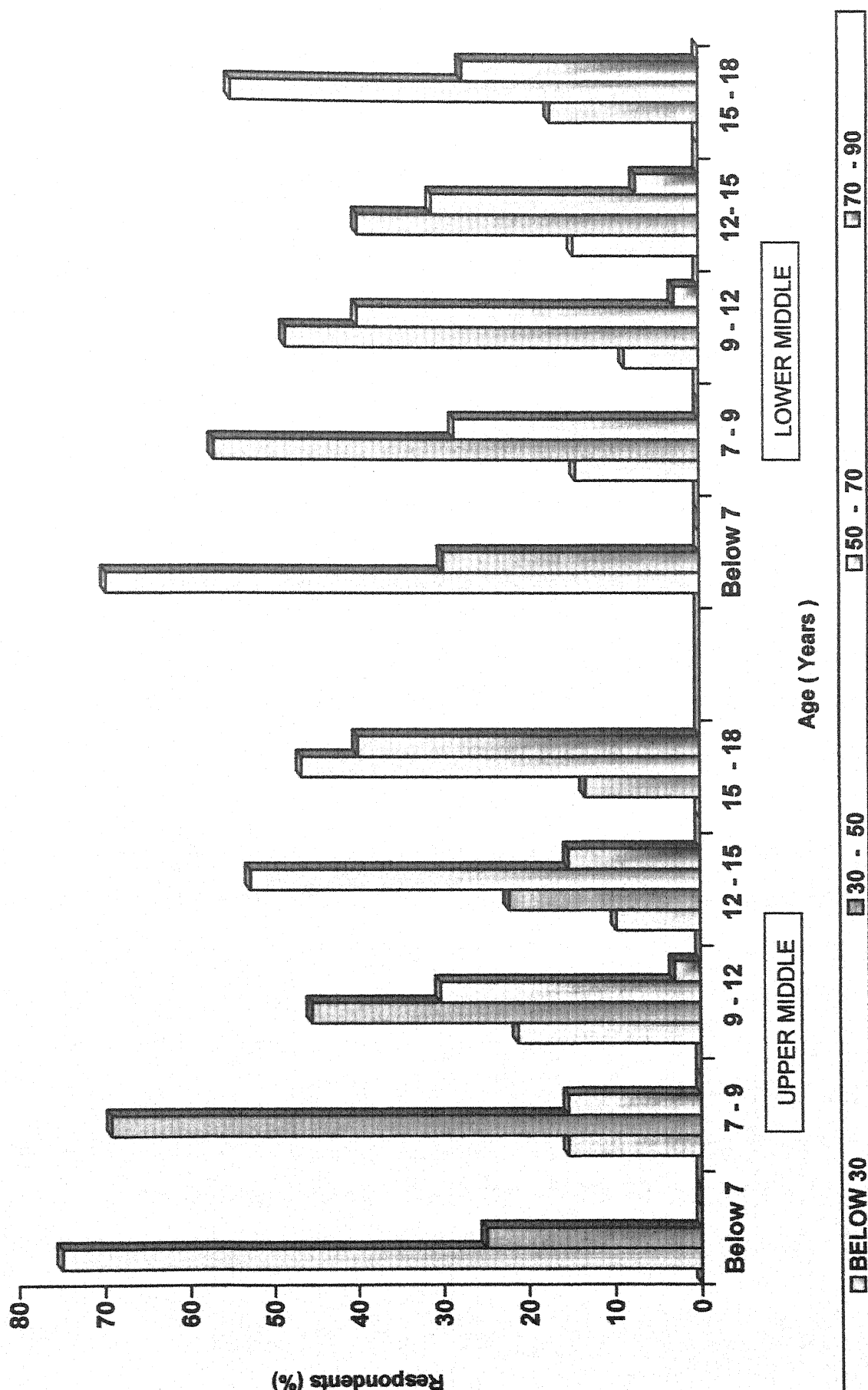
4.3.2 Daily Intake of protein in respondents of upper middle and lower middle class

Table 8 reveals that in the age group of below 7 years, the protein below 30 gm was consumed by more girls in upper middle class (69.23 %) than those in lower middle class (55.56%), while protein between 30-50 gm was taken by more respondents in lower middle class (44.44%) than in upper middle class family (30.75%). Similar trend was found in boy respondents.

In the 7-9 years age group, the protein below 30gm was consumed by more girls in lower middle class (29.41%) than in upper middle class family (27.27%). Conversely protein between 30-50 gm & 50-70 gm were consumed by more respondents in upper middle class (63.63% & 9.09%) than in lower middle class family (61.76 %& 8.82%). In the boys, protein below 30 gm & 30-50 gm was consumed by more respondents in upper middle class (15.38% & 69.23%) than in lower middle class family (14.28% & 57.14%). But protein between 50-70 gm was taken by more boys in lower middle class (28.57%) than those in upper middle class family(15.38%).

Data further reveals, that protein below 30 gm and 30-50 gm was consumed by more girls of 9-12 years age group in upper middle class (8.11 %and 67.57%) than those in lower middle class family (3.45 % and 62.07 %), but protein between 50-70 gm was consumed by more respondents in lower middle class(34.48 %) than those in upper middle class (24.32 %). Protein below 30 gm was consumed by more boys in upper middle class (21.21 %) than in lower middle class (8.57%), but protein between 30-50 gm & 50-70 gm was taken by more respondents in lower middle class (48.57 % and 40.0 %) than

[86]

those in upper middle class family (45.45 % and 30.3%). The intake between 70-90 gm was identical in both classes (3.03 % & 2.86 %).

In the 12-15 years age group, the protein below 30 gm between 50-70 gm and 70-90 gm was consumed by more girls in lower middle class (4.26 % , 57.5% and 14.89 %)than those in upper middle class family (2.5 % , 45.0 % and 5.0 %). Conversely protein between 30-50 gm was taken by more respondents in upper middle class (47.5%) than those in lower middle class (23.4 %) . Concerning boy respondents, the protein between below 30 gm and 30-50 gm was consumed by more boys in lower middle class (14.54 % and 40.0 %) than in upper middle class family (9.27 % and 22.22 %) , but protein between 50-70 gm and 70-90 gm was consumed by more respondents in upper middle class (57.78 % and 15.28 %) than in lower middle class family (31.18 % and 7.27 %) .

Results further show that, the protein between below 30 gm and 50-70 gm was consumed by more girls of 15-18 years age group in lower middle class (6.45 % and 70.97 %) than those in upper middle class (5.26% and 39.47 %), while protein between 30-50 gm and 70-90 gm was consuming by more respondents in upper middle class (44.74 % and 10.53%) than those in lower middle class family (19.35 % and 3.23 %) . Concerning boy, the protein between 30-50 gm and 50-70 gm was consumed by more respondents in lower middle class (17.24 % and 55.17 %) than those is upper middle class (13.33% and 46.67 %) , but protein between 70-90 gm was taken by more boys in upper middle class (40.0 %) than in lower middle class family (27.59 %) .(Fig.9A,9B)

TABLE - 9

Distribution of respondents according to the fat intake

N=600

Age (Years)		Upper middle				Fat (gm) Lower middle			
		below 20	20 - 40	40 - 60	60 - 80	below 20	20 - 40	40 - 60	60 - 80
Below 7	G	-	10 (76.92)	3 (23.08)	-	2 (22.22)	4 (44.44)	3 (33.33)	
	B	-	3 (75.0)	1 (25.0)	-	-	8 (80.0)	2 (20.0)	-
7 - 9	G	2 (9.09)	15 (68.18)	5 (22.73)		5 (14.71)	17 (50.0)	12 (35.29)	
	B	3 (11.54)	19 (73.08)	4 (15.38)		2 (9.52)	16 (76.19)	3 (14.29)	
9 - 12	G	2 (5.41)	29 (78.38)	6 (16.21)		4 (13.79)	14 (48.28)	11 (37.93)	
	B	4 (12.12)	22 (66.67)	7 (21.21)		5 (14.29)	22 (62.86)	8 (22.85)	
12 - 15	G	2 (5.0)	26 (65.0)	12 (30.0)		7 (14.89)	21 (44.68)	18 (38.29)	1 (2.13)
	B	8 (11.11)	52 (72.22)	12 (16.67)		9 (16.36)	34 (61.82)	10 (28.57)	2 (5.71)
15 - 18	G	1 (2.63)	24 (63.16)	12 (31.58)	1 (2.63)	7 (22.58)	17 (54.84)	7 (22.58)	
	B	1 (6.67)	11 (73.33)	3 (20.0)		4 (13.79)	16 (55.17)	9 (31.03)	

Figures in parenthesis indicate percentage   G - Girl   B - Boy

N = total no. of respondents

[88]

FIG. 10A : Intake of fat (gm) in Girls.

[89]
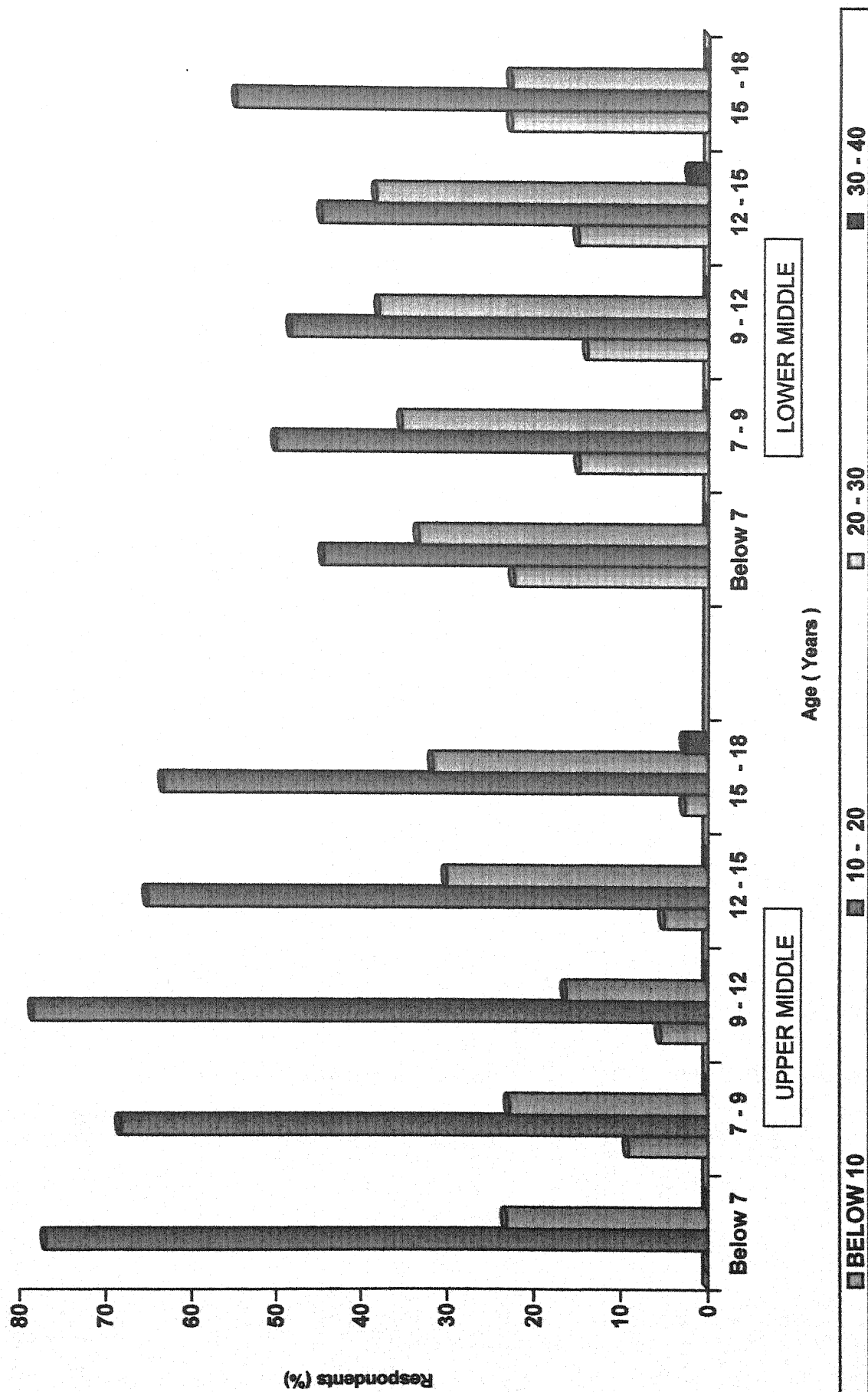
FIG. 10B : Intake of fat (gm) in Boys.

[90]
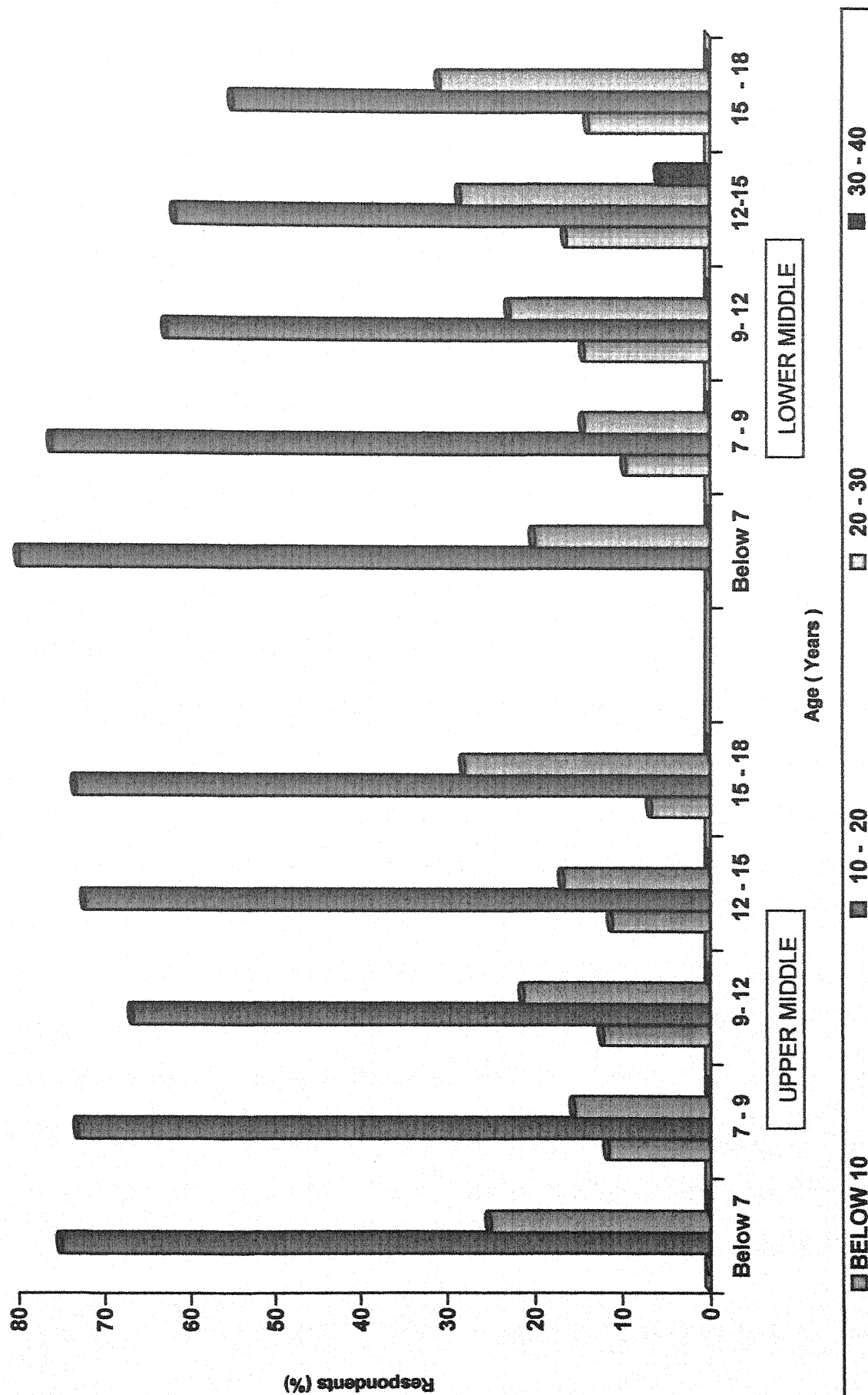
4.3.3 Daily Intake of fat in respondents of upper middle and lower middle class

Table 9, based on consumption pattern of fat, indicates that, the fat between 10-20 gm was consumed by more girls of age group below 7 years in upper middle class (76.92%) than in lower middle class (44.44%), but fat between 20-30 gm was consumed by more girls in lower middle class (33.33%) than those in upper middle class (23.08%). Only 22.22% respondents of lower middle class were taking fat below 10 gm. Concerning boys, fat between 10-20gm was consumed by more respondents in lower middle class (80.0%) than in upper middle class (75.0%) .Conversely, fat between 20-30 gm was consumed by more boys in upper middle class (25%) than in lower middle class (20.0%).

Results further show that, the fat below 10 gm and between 20-30 gm was consumed by more girls of age group 7-9 years in lower middle class (14.71% and 35.29%) than those in upper middle class (9.09% and 22.73%),but fat between 10-20 was consumed by more girls in upper middle class (68.18%) than in lower middle class(50%). In the boys, fat below 10 gm and between 20-30 gm was consumed by more respondents in upper middle class (11.54% and 15.38%) than those in lower middle class (9.52% and 14.29%). The fat between 10-20 gm was consumed by more boys in lower middle class (76.19%) than in upper middle class (73.08%).

In 9-12 years age group, the fat below 10 gm and 20-30 gm was consumed by more girls in lower middle class (13.79% and 37.93%) than those in upper middle class family (5.41% and 16.21%).

[91]

Conversely fat between 10-20 gm was consumed by more respondents in upper middle class (78.38%) than in lower middle class (48.28%). Similar trend was found in boy respondents.

Results further indicate that, the fat below 10 gm and between 20-30 gm was consumed by more girl respondents of age group 12-15 years in lower middle class (14.89% and 38.29%) than in upper middle class family (5.0% and 30.0%), but fat between 10-20 gm was taken by more respondents in upper middle class (65.0%)than in lower middle class (44.68%). Only 2.13 percent respondents of lower middle class were taking fat 30-40 gm. Similar trend was seen in boy respondents.

Concerning 15-18 years age group, the fat below 10 gm was consumed by more girls in lower middle class (22.58%) than in upper middle class (2.63%) , but fat between 10-20 gm and 20-30 gm was consumed by more respondents in upper middle class (63.16% and 31.58%) than in lower middle class (54.84% and 22.58%). The consumption between 30-40 gm was seen in respondents of only upper middle class family (2.63%). Regarding boys, fat below 10 gm and between 20-30 gm was consumed by more respondents in lower middle class (13.79% and 31.03%) than in upper middle class (6.67% and 20.0%),while fat between 10-20 gm was consumed by more boys in upper middle class (73.33%) than in lower middle class family (55.17%). (Fig. 10A, 10B)

TABLE - 10

Distribution of respondents according to the cereals intake

Age (Years)		Cereals (gm)									
		Upper middle					Lower Middle				
		100 -200	200 -300	300 -400	400- 500	above500	100 -200	200 -300	300 -400	400- 500	above500
Below 7	G	7 (53.85)	6 (46.15)				5 (55.56)	3 (33.33)	1 (11.11)		
	B	2 (50.0)	2 (50.0)				2 (20.0)	2 (60.0)	2 (20.0)		
7 - 9	G	7 (31.82)	11 (50.0)	4 (18.18)			8 (23.53)	17 (50.0)	9 (26.47)		
	B	11 (42.31)	12 (46.15)	3 (11.54)			5 (23.81)	10 (47.62)	6 (28.57)		
9 - 12	G	3 (8.12)	19 (51.35)	14 (37.83)	1 (2.70)		1 (3.45)	10 (34.48)	14 (48.28)	4 (13.79)	
	B	1 (3.03)	17 (51.52)	11 (33.33)	4 (12.12)		3 (8.57)	7 (20.0)	18 (51.43)	7 (20.0)	
12 - 15	G	2 (5.0)	9 (22.5)	22 (55.0)	7 (17.5)		-	15 (31.91)	24 (51.06)	8 (17.03)	
	B	-	4 (5.56)	27 (37.5)	26 (36.11)	15 (20.83)	1 (1.82)	5 (9.09)	16 (29.09)	22 (40.0)	11 (37.93)
15 -1 8	G	3 (7.89)	11 (28.95)	21 (55.26)	3 (7.89)		1 (3.23)	5 (16.13)	14 (45.16)	11 (35.48)	
	B	-	1 (6.67)	3 (20.0)	6 (40.0)	5 (33.33)	-	1 (3.45)	4 (13.79)	19 (65.52)	5 (17.24)

Figure in parenthesis indicate percentage

N = total no. of respondents

G - Girl   B -Boy

[93]

FIG. 11A : Intake of cereals (gm) in girls.

[94]

FIG. 11B : Intake of cereals (gm) in boys.

Respondents (%)

Age (Years)

□ 100 - 200   ■ 200 - 300   □ 300 - 400   □ 400 - 500   ■ above 500

UPPER MIDDLE

LOWER MIDDLE

[95]

4.3.4 distribution of respondents according to intake of cereals

Table 10 shows that the cereals between 100-200 gm were consumed by more girls of below 7 years age group in lower middle class (55.56 %) than in upper middle class (53.85 %) ,but cereals between 200-300 gm were consumed by more respondents in upper middle class(46.15 %) than in lower middle class (33.33). Only 11.11 percent respondents of lower middle class were consuming cereals between 300-400 gm. Concerning boy respondents, 50 percent were taking cereals between 100-200 gm and rest 50 percent were taking cereals between 200-300 gm in upper middle class family . 20 percent respondents of lower middle class were consuming cereals between 100 - 200 gm , 20 % respondents were consuming 300-400 gm and 60.0 % were taking cereals between 200-300 gm .

In the age group of 7-9 years, cereals between 100-200 gm were consumed by more girl in upper middle class (31.82 %) than those in lower middle class (23.53 %), but cereals between 300-400 gm were consumed by more respondents in lower middle class (26.47 %) than those in upper middle class (18.18 %). The intake between 200-300 gm was identical in both classes (50% respectively). The cereals between 100-200 gm was consumed by more boys in upper middle class (42.31 %) than in lower middle class (23.81 %) ,while cereals between 200-300 gm and 300-400 gm were consumed by more respondents in lower middle class (47.62 % and 28. 57 %) than in upper middle class gamily (46.15 % and 11.54 %).

[96]

The cereals between 100-200 gm and 200-300 gm were consumed by more girl of 9-12 years age group in upper middle class (8.12% and 51.35 %) than in lower middle class (3.45% and34.48%). However, cereals between 300-400 gm and 400-500 gm were consumed by more respondents in lower middle class (48.28 % and 13.79 %) than in upper middle class family (37.83 % and 2.70 %). Data further reveals, that the cereals between 200-300 gm were consumed by more boys in upper middle class(51.52%) than in lower middle class (20.0%), while cereals between 100-200 gm, 300-400 gm and 400-500 gm were taken by more respondents in lower middle class (8.57% , 51.43% and 20.0%) than in upper middle class family (3.03%, 33.33% and 12.12%).

Result further indicates that in the 12-15 years age group, the cereals between 200-300 were consumed by more girls in lower middle class (31.91%) than in upper middle class (22.5%). The cereals between 300-400 gm were consumed by more girls in upper middle class (55.0%) than in lower middle class family (51.06%). Only 5.0percent girls of upper middle class were taking cereals between 100-200 gm , while intake level between 400-500 gm was identical (17.5% and 17.02%) in both family classes.

Data on consumption pattern of cereals in girl respondents of age group between15-18 years indicates that , the cereals between 100-200 gm, 200-300 gm and 300-400 gm were consumed by more girls in upper middle class (7.89%, 28.95 and 55.26%) than those in lower middle class family (3.23%, 16.13% and 45.16%). Conversely , cereals between 400-500 gm were consumed by more respondents in

lower middle class (35.48%) than in upper middle class (7.89%), while in boys, the cereals between 200-300 gm, 300-400 gm and above 500 gm were consumed by more respondents in upper middle class 6.67%, 20.0% and 33.33%) than in lower middle class family (3.45%, 13.79% and 17.24%), but cereals between 400-500 gm were consumed by more boys in lower middle class (65.52%) than those in upper middle class family (40.0%) (Fig. 11A, 11B)

TABLE - 11

Distribution of respondents according to the pulses intake

N=600

Age (Years)		Pulses (gm)									
		Upper Middle					Lower middle				
		below 20	20 - 40	40 - 60	60 - 80	above 80	below 20	20 - 40	40 - 60	60 - 80	above 80
Below 7	G	-	9 (69.23)	4 (30.77)			-	4 (44.44)	4 (44.44)	1 (11.11)	
	B	1 (25.0)	2 (50.0)	1 (25.0)			1 (10.0)	7 (70.0)	2 (20.0)	-	
7 - 9	G	1 (4.54)	8 (36.36)	9 (40.91)	4 (18.18)		2 (5.88)	15 (44.12)	12 (35.29)	5 (14.71)	
	B	3 (11.54)	12 (46.15)	8 (30.77)	3 (11.54)		-	6 (28.57)	12 (57.14)	3 (14.29)	
9 - 12	G	4 (10.81)	16 (43.24)	11 (29.73)	6 (16.22)		1 (3.45)	8 (27.59)	12 (41.38)	8 (27.58)	
	B	2 (6.06)	11 (33.33)	12 (36.36)	7 (21.21)	1 (3.03)	3 (8.57)	7 (20.0)	15 (42.86)	8 (22.86)	2 (5.71)
12 - 15	G	1 (2.5)	12 (30.0)	21 (52.5)	6 (15.0)	-	2 (4.25)	12 (25.53)	18 (38.29)	14 (29.79)	1 (2.13)
	B	4 (5.55)	25 (34.72)	22 (30.55)	16 (22.22)	5 (6.94)	-	18 (32.73)	22 (40.0)	10 (18.18)	5 (9.09)
15 - 18	G	-	11 (28.75)	17 (44.74)	8 (21.05)	2 (5.26)	1 (3.23)	9 (29.03)	13 (41.94)	6 (19.35)	2 (6.45)
	B	-	6 (40.0)	6 (40.0)	3 (20.0)	-	-	4 (13.79)	14 (48.28)	10 (34.48)	1 (3.45)

Figures in parenthesis indicate percentage

N = total no. of respondents

G - Girl   B -Boy
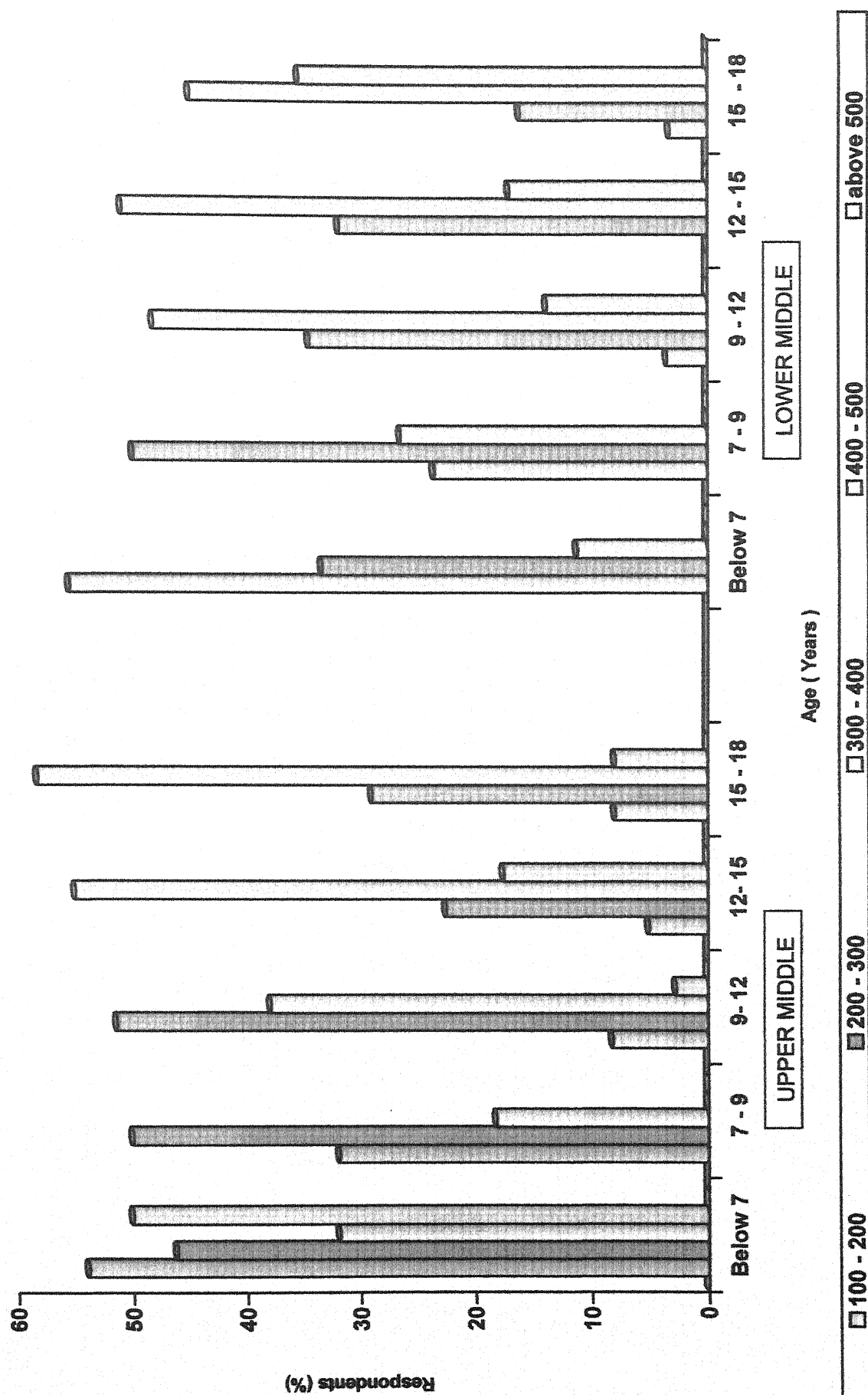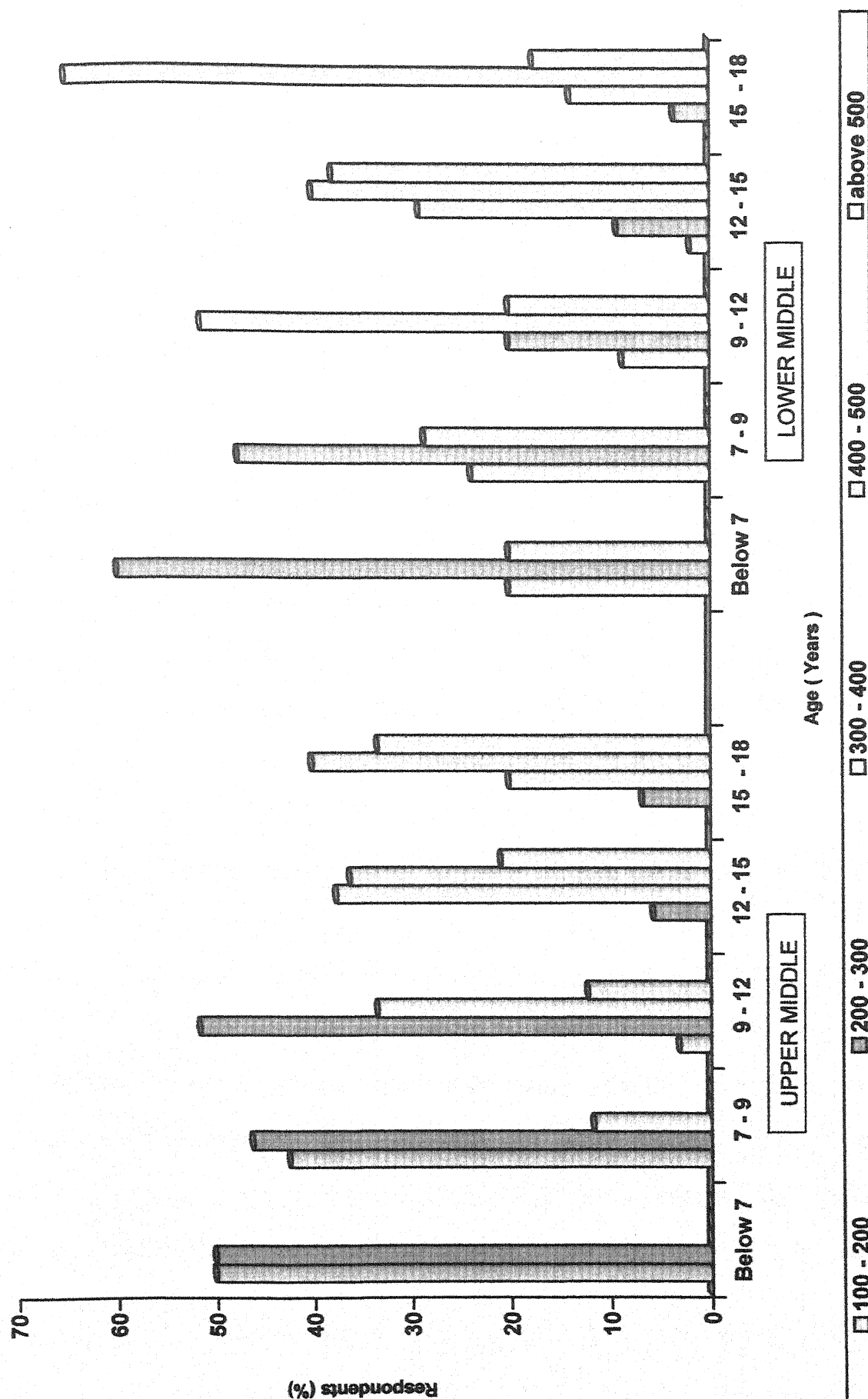
[99]

FIG. 12A : Intake of Pulses (gm) in girls.

Age (Years)

Respondents (%)

UPPER MIDDLE

LOWER MIDDLE

■ BELOW 20   ■ 20 - 40   ■ 40 - 60   □ 60 - 80   ■ above 80

[100]
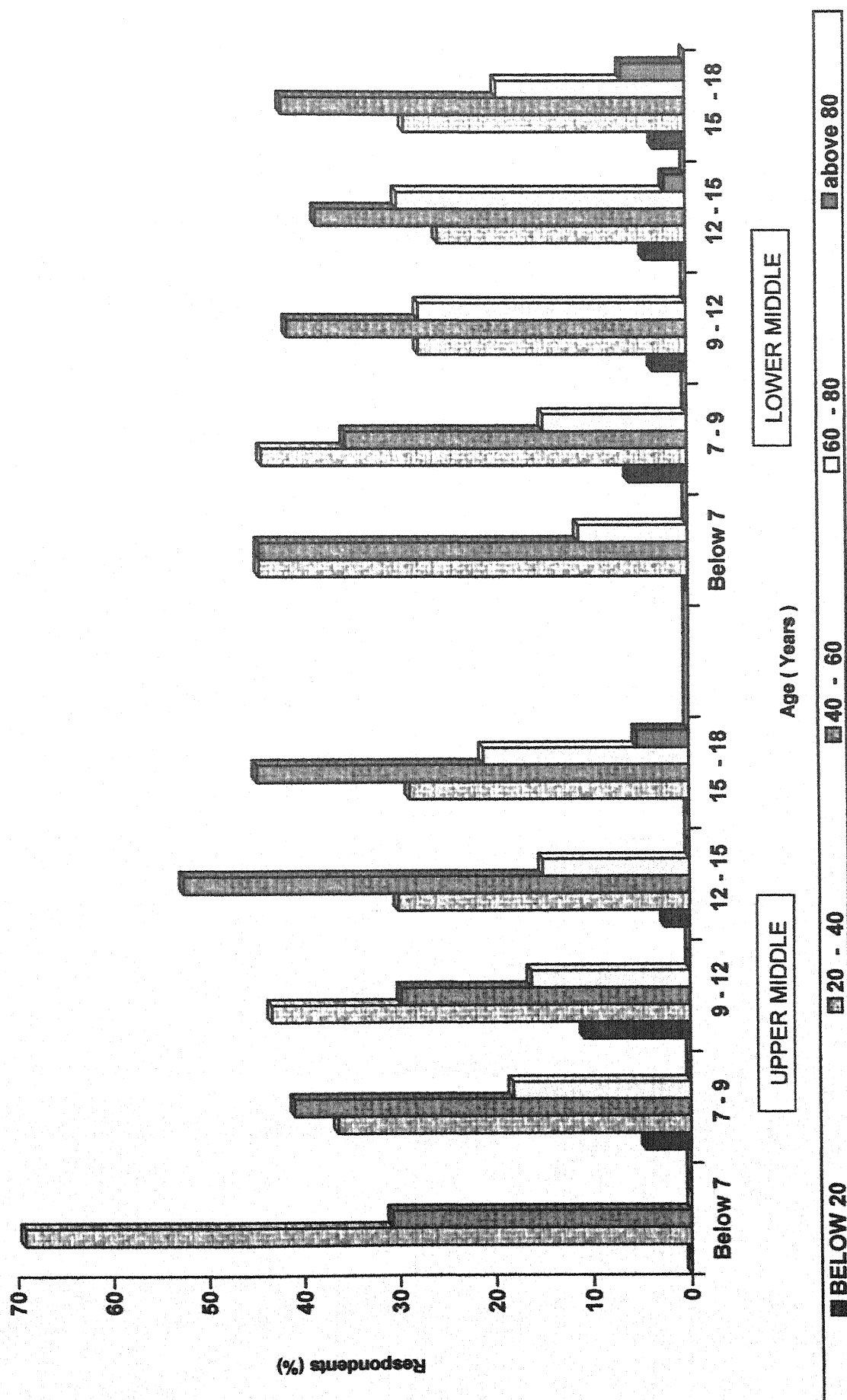
FIG. 12B : Intake of Pulses (gm) in boys.

[101]
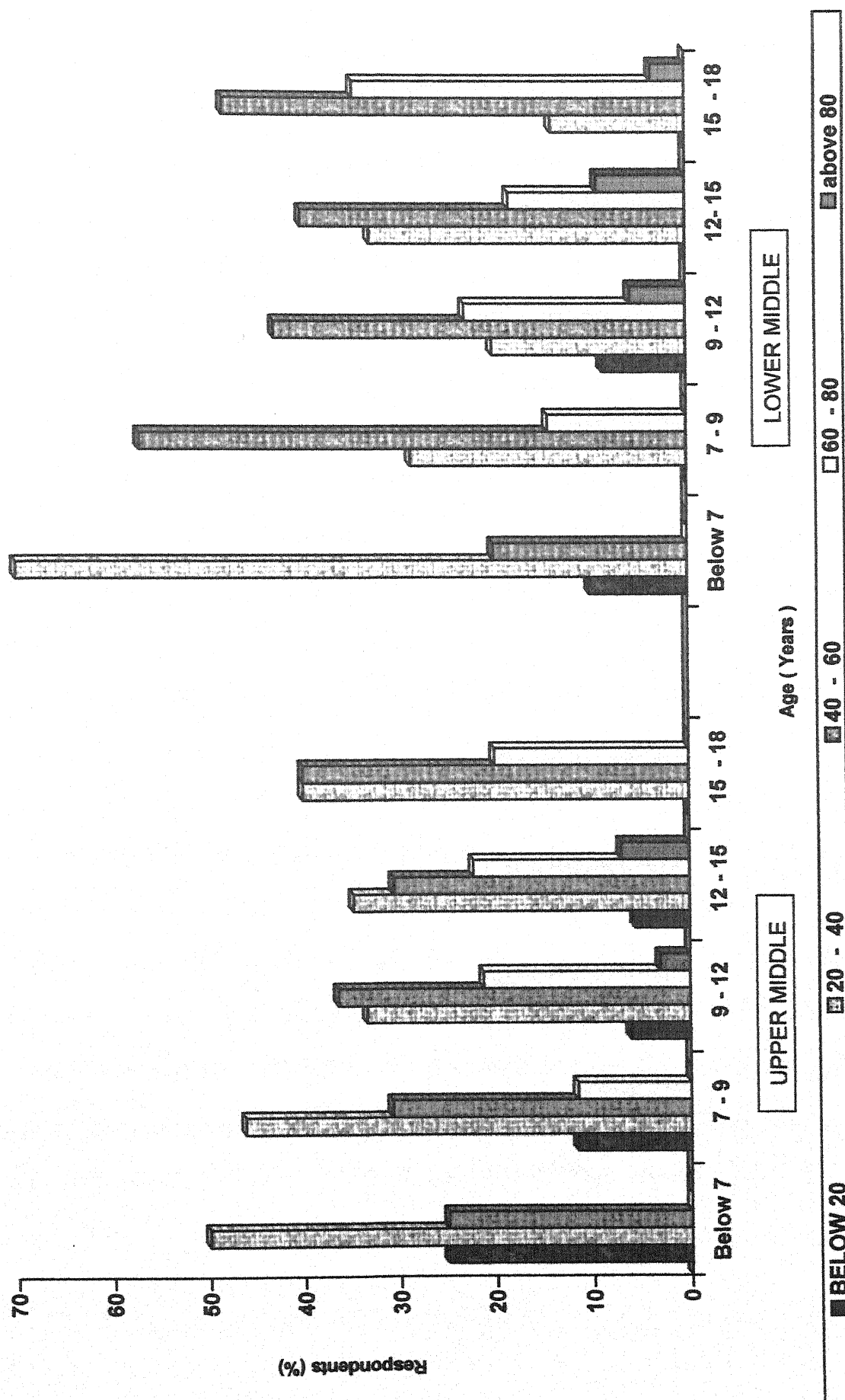
4.3.5 Distribution of respondents according to intake of pulses

Table 11, based on consumption of pulses, shows that pulses between 20-40 gm were consumed by more girls of below 7 years age group in upper middle class (69.23%) than in lower middle class (44.44%) but pulses between 40-60 gm were consumed by more respondents in lower middle class (44.44%) than in upper middle class (30.77%). Only 11.11 percent respondent of lower middle class were taking pulses between 60-80 gm. Concerning boys, pulses below 20 gm and 40-60 gm were consumed by more boys in upper middle class (25.0%respectively) than in lower middle class (10.0% and 20.0%). Conversely pulses between 20-40 gm were consumed by more respondents in lower middle class (70.0%) than in upper middle class (50.0%).

The pulses below 10 gm and 20-40 gm were consumed by more girls of 7-9 years in lower middle class (5.88% and 44.12%) than in upper middle class (4.54% and 36.36%). The pulses between 40-60 gm and 60-80 gm were consumed by more respondents in upper middle class (40.91% and 18.18%) than those in lower middle class (35.29% and 14.71%). In the boy respondents, pulses between 20-40 gm were taken by more boys in upper middle class (46.15%) than in lower middle class (28.57%), but pulses between 40-60 gm and 60-80 gm were consumed by more respondents in lower middle class (57.14% and 14.29%) than in upper middle class (30.77% and

11.54%). The intake below 20 gm was seen only in upper middle class family (11.54%).

Results further reveal that in the 9-12 years age group, the pulses below 20 gm and 20-40 gm were taken by more girls in upper middle class (10.81% and 43.24%) than those in lower middle class (3.45% and 27.59%) . The pulses between 40-60 gm and 60-80 gm were consumed by more girls in lower middle class (41.38% and 27.58%) than in upper middle class family (29.73% and 16.22%). In boys, pulses between 20-40 gm was consumed by more respondents in upper middle class (33.33%) than those in lower middle class (20.0%), but rest of intake was more in respondents of lower middle class than those in upper middle class family.

Data based on consumption pattern of pulses indicates that , the pulses below 20 gm and between 60-80 gm were consumed by more girls of 12-15 years in lower middle class (4.25% and 29.79%) than in upper middle class family (2.5% and 15.0%), Conversely, pulses between 20-40 gm and 40-60 gm were consumed by more respondents in upper middle class (30.0% and 52.5%) than those in lower middle class family (25.53% and 38.29%). Only 2.13 percent respondents of lower middle class were taking pulses above 80gm. Concerning boy respondents, the pulses between 20-40 gm and 40-60 gm were consumed by more boys in upper middle class (34.72% and 22.22%) than those in lower middle class (32.73% and 18.18%), but intake between 40-60 and above 80 gm were taken by more respondents in lower middle class (40.0% and 9.09%) than in upper

middle class family (30.55% and 6.94%). The intake below 20 gm was found only in boys of upper middle class family (5.55%).

In 15-18 years age group, the pulses between 40-60 gm and 60-80gm were consumed by more girls in upper middle class (44.74% and 21.05%) than those in lower middle class (41.94% and 19.35%),but pulses between 20-40 gm and above 80 gm were consumed by more respondents in lower middle class (29.03% and 6.45%) than in upper middle class(44.74% and 5.26%). Only 3.23 percent girls of lower middle class were consuming pulses below 20 gm. The pulses between 20-40 gm were consumed by more boys in upper middle class (40.0%) than in lower middle class (13.79%), but pulses between 40-60 gm and 60-80 gm were consumed by more boys in lower middle class (48.28% and 34.48%) than in upper middle class (40.0% and 20.0%). The intake of pulses above 80 gm was seen only in lower middle class respondents (3.45%). (Fig. 12A, 12B)

TABLE - 12

Distribution of respondents according to the green leafy vegetable intake

Green leafy vegetable(gm)

Age (Years)		Upper middle					Lower Middle				
		Nil	below 50	50-100	100-150	150-200	Nil	below 50	50-100	100-150	150-200
below 7	G	-	6 (46.15)	5 (38.46)	2 (15.38)	-	1 (11.11)	6 (66.67)	2 (22.22)	-	-
	B		3 (75.0)	1 (25.0)	-	-	1 (10.0)	5 (50.0)	4 (40.0)	-	--
7 - 9	G	2 (9.09)	16 (72.73)	4 (18.18)	-	-	3 (8.82)	20 (58.82)	11 (32.35)	-	-
	B	1 (3.85)	16 (61.54)	9 (34.61)	-	-	-	9 (42.86)	12 (57.14)	-	-
9 - 12	G	-	20 (54.05)	15 (40.54)	2 (5.41)	-	-	11 (37.93)	11 (37.93)	7 (24.14)	-
	B	1 (3.03)	14 (42.42)	14 (42.42)	4 (12.12)	-	-	18 (51.43)	16 (45.71)	1 (2.86)	-
12 - 15	G	2 (5.0)	9 (22.5)	16 (40.0)	13 (32.5)	-	3 (6.38)	14 (29.79)	24 (51.06)	6 (12.77)	-
	B	7 (9.72)	33 (45.83)	30 (41.67)	2 (2.78)	-	1 (1.82)	27 (49.09)	16 (29.09)	11 (20.0)	-
15 - 18	G	2 (5.26)	15 (39.47)	12 (31.58)	7 (18.42)	2 (5.26)	2 (6.45)	10 (32.26)	11 (35.48)	5 (16.13)	3 (9.68)
	B	1 (6.67)	6 (40.0)	5 (33.33)	3 (20.0)	-	-	25 (86.2)	4 (13.79)	-	-

Figures in parenthesis indicate percentage

N = total no. of respondents

G - Girl   B -Boy

[105]

FIG. 13A : Intake of green leafy vegetable (gm) in girls.

[106]
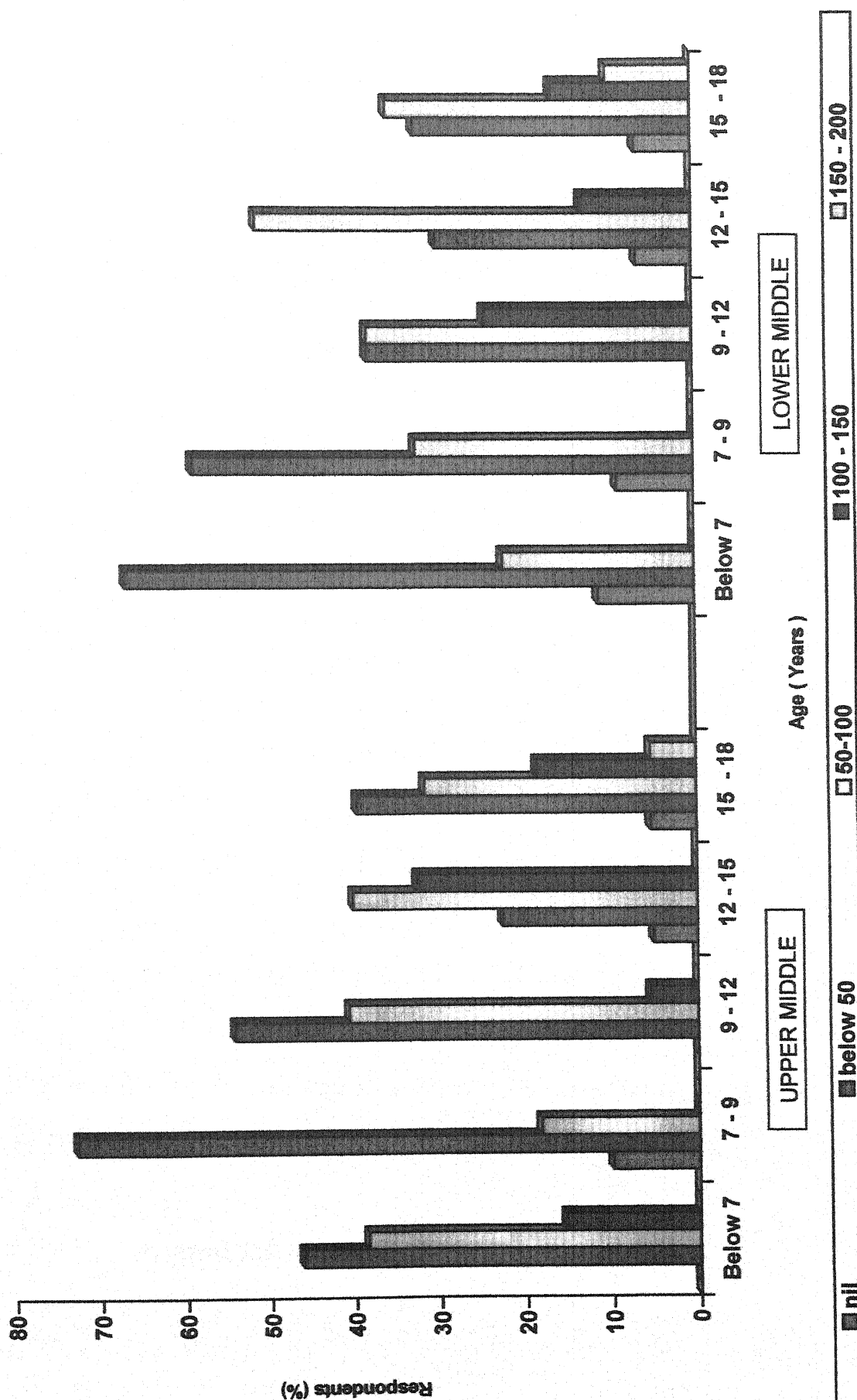
FIG. 13B : Intake of green leafy vegetable (gm) in boys.

[107]
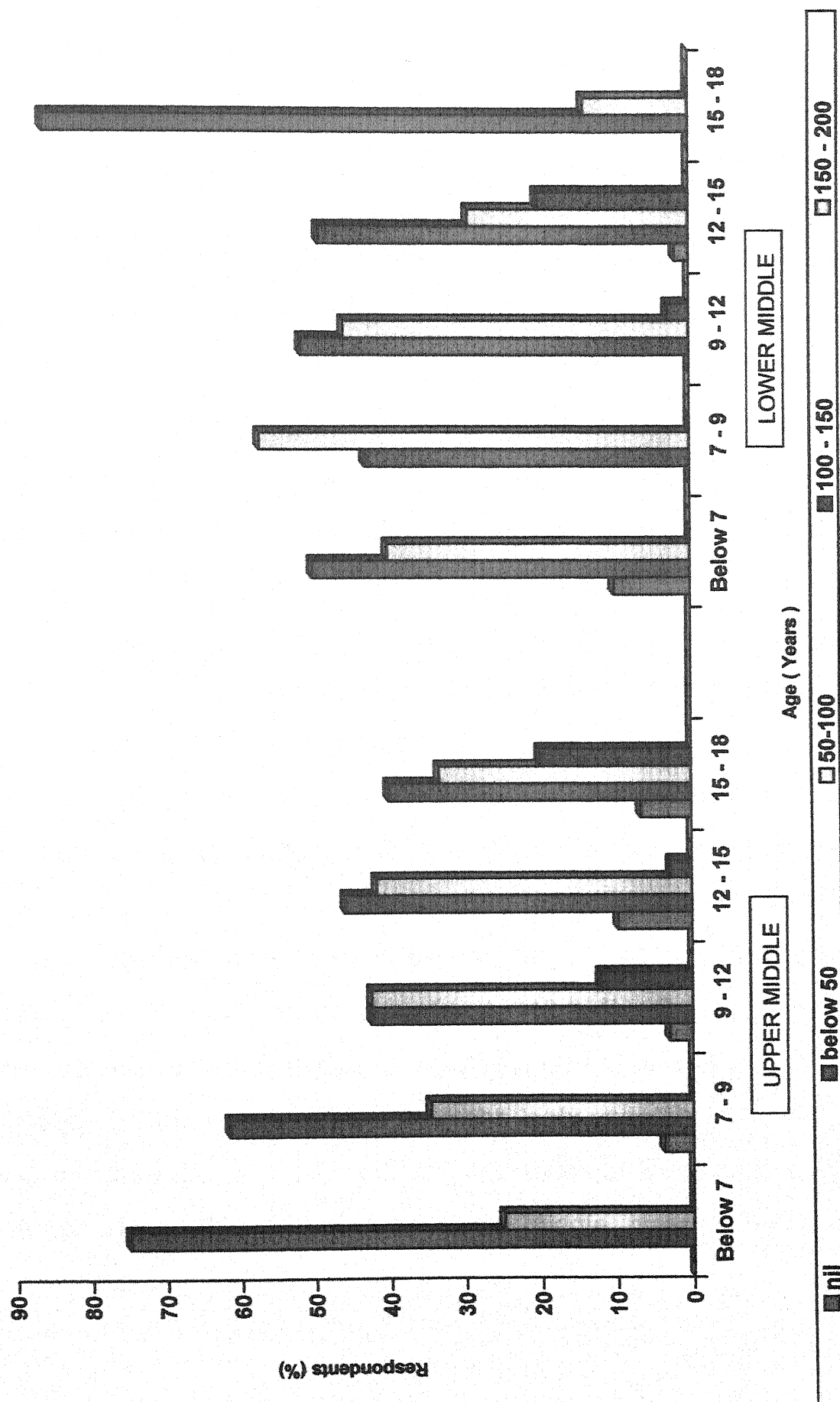
4.3.6 Distribution of respondents according to intake of green leafy- vegetables

Table 12 reveals that in the below 7 years age group, green leafy vegetables below 50gm were consumed by more girls in upper middle class (46.15%) than in lower middle class family (11.11%), while green leafy vegetables between 50-100 gm and 100-150 gm were consumed by more respondents in lower middle class (66.67% and 22.22%) than those in upper middle class family (38.46% and 15.38%). In the boy respondents, the green leafy vegetables below 50 gm were consumed by more boys in upper middle class (75.0%) than those in lower middle class (50.0%).Conversely green leafy vegetable between 50-100 gm was consumed by more respondents in lower middle class family (40.0%) than in upper middle class family (25.0%). Only 10 percent respondents of lower middle class family were not consuming green leafy vegetable.

Data further reveals that, the green leafy vegetables below 50gm was consumed by more girls of age group 7-9 years in upper middle class (72.73%) than in lower middle class (58.82%), while between 50-100 gm was consuming by more girls in lower middle class (32.35%) than those in upper middle class family (18.81%). Only 9.09 percent respondents of upper middle class and 8.82% respondents of lower middle class were not consuming green leafy vegetable. In the boys, green leafy vegetables below 50gm were taken by more boys in upper middle class (61.54%) than in lower middle class (42.86%) but

between 50-100 gm was taken by more respondents in lower middle class (57.14%) than those in upper middle class family (34.61%). Only 3.85 percent respondents of upper middle class were not taking green. leafy vegetables.

Data based on consumption pattern of green leafy vegetables in girls respondents of 9-12 years age group indicates that, the below 50 gm and between 50-100 gm were consumed by more girls in upper middle class (54.05% and 40.54%) than in lower middle class family (37.93%), but green leafy vegetables between 100-150gm were consumed by more respondents in lower middle class (24.14%) than in upper middle class family (5.41%). Concerning boys, vegetables below 50gm and 50-100 gm were consumed by more boys in lower middle class (51.43% and 45.71%) than in upper middle class family (42.42%). Conversely, green leafy vegetables between 100-150 gm were consumed by more boys in upper middle class (12.12%) than in lower middle class family (2.86%). Only 3.13 percent respondents of upper middle class were not consuming green leafy vegetables.

In 12-15 years age group green leafy vegetables below 50gm and between 50-100 gm were consumed by more girls in lower middle class (29.79 and 51.06%) than in upper middle class family (22.5% and 40%),but vegetables between 100-150 gm were consumed by more respondents in upper middle class (32.5%) than in lower middle class family (12.77%), while 5 percent respondents of upper middle class and 6.38 percent respondents of lower middle class family were not consuming green leafy vegetables. In the boys, green leafy

[109]

vegetables below 50gm and between 100-150 gm were consumed by more respondents in lower middle class family (49.09% and 20%) than those in upper middle class family (45.83% and 2.78%), but vegetable between 50-100 gm were consumed by more boys in upper middle class (41.67%) than in lower middle class family (29.09%). Only 9.72 percent respondents of upper middle class and 1.82 percent respondents of lower middle class were not consuming green leafy vegetable.

Results further show that in the 15-18 years are group, green leafy vegetables below 50 gm, 50-100 gm and 100-150 gm were consumed by more girl respondents in upper middle class (39.47%,31.58% and 18.42%) than those in lower middle class family (32.26%, 35.48% and 16.13%). Conversely, vegetables between 150-200 gm were consumed by more girls in lower middle class (9.68%) than those in upper middle class family (5.26%),while 5.26 percent and 6.45 percent respondents of upper middle class and lower middle class were not taking green leafy vegetables respectively. In the boys, green leafy vegetables below 50 gm were consumed by more respondents of lower middle class (86.2%) than in upper middle class family (40%), whereas vegetables between 50-100 gm were consumed by more boys in upper middle class (33.33%) than those in lower middle class family (13.79%). The consumption between 100-150 gm was found only in respondents of upper middle class family(20%),while 6.67% respondents of upper middle class were not consuming green leafy vegetables. (Fig.13A,13B)

TABLE - 13

Distribution of respondent according to the root & other vegetable intake

N=600

Age (Years)		Root & other vegetable intake(gm)							
		Upper middle				Lower middle			
		30 - 50	50 - 70	70 - 90	above 90	30 - 50	50 - 70	70 - 90	above 90
Below 7	G	3 (23.07)	9 (69.23)	1 (9.69)	-	1 (11.11)	3 (33.33)	5 (55.56)	-
	B	1 (25.0)	-	1 (25.0)	2 (50.0)	1 (10.0)	7 (70.0)	1 (10.0)	1 (10.0)
7 - 9	G	4 (18.18)	10 (45.45)	7 (31.82)	1 (4.55)	8 (23.53)	16 (47.06)	9 (26.47)	1 (2.94)
	B	1 (3.85)	8 (30.77)	12 (46.15)	5 (19.23)	4 (19.05)	6 (28.57)	11 (52.38)	-
9 - 12	G	7 (18.72)	11 (29.73)	13 (35.14)	6 (16.22)	4 (13.79)	9 (31.03)	11 (37.93)	5 (17.54)
	B	6 (18.18)	22 (66.67)	3 (9.09)	2 (6.06)	3 (8.57)	7 (20.0)	11 (31.43)	14 (40.0)
12 - 15	G	3 (7.5)	13 (32.5)	14 (35.0)	10 (25.0)	4 (8.51)	11 (23.4)	16 (34.04)	16 (34.04)
	B	3 (4.17)	32 (44.44)	18 (25.0)	19 (26.39)	9 (16.36)	16 (29.09)	19 (34.55)	11 (20.0)
15 - 18	G	11 (28.95)	7 (18.42)	12 (31.58)	8 (21.05)	2 (6.45)	9 (29.03)	11 (35.48)	9 (29.03)
	B	3 (20.0)	5 (33.33)	2 (13.33)	5 (33.33)	-	10 (34.48)	14 (48.28)	5 (17.24)

Figures in parenthesis indicate percentage

N = total no. of respondents   G - Girl   B -Boy

[111]

FIG. 14A : Consumption of roots & other vegetable (gm) in girls.

[112]
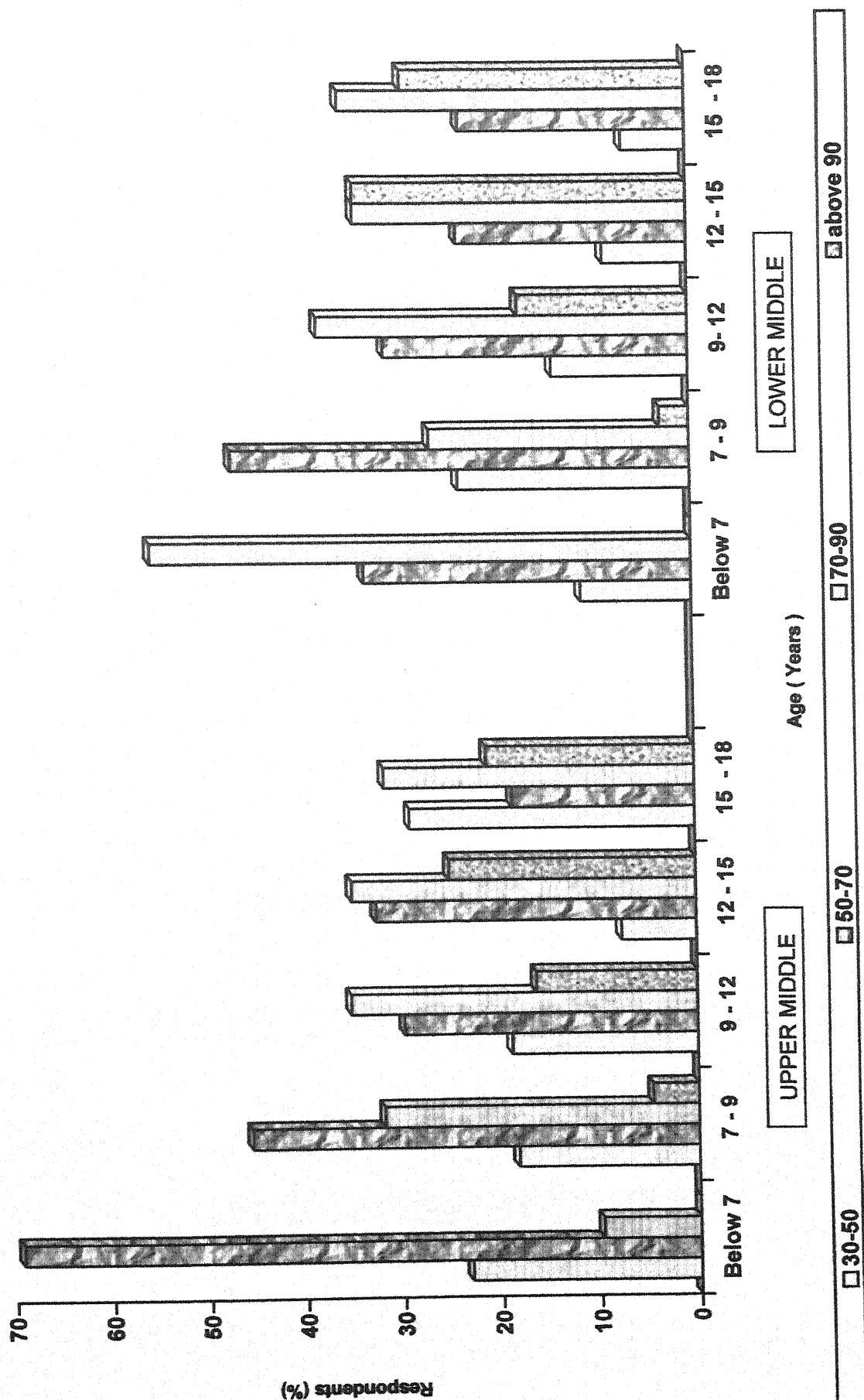
FIG. 14B : Consumption of roots & other vegetable (gm) in boys.

Respondents (%)

Age (Years)

UPPER MIDDLE

LOWER MIDDLE

☐ 30-50 ☐ 50-70 ☐ 70-90 ☐ above 90

[113]
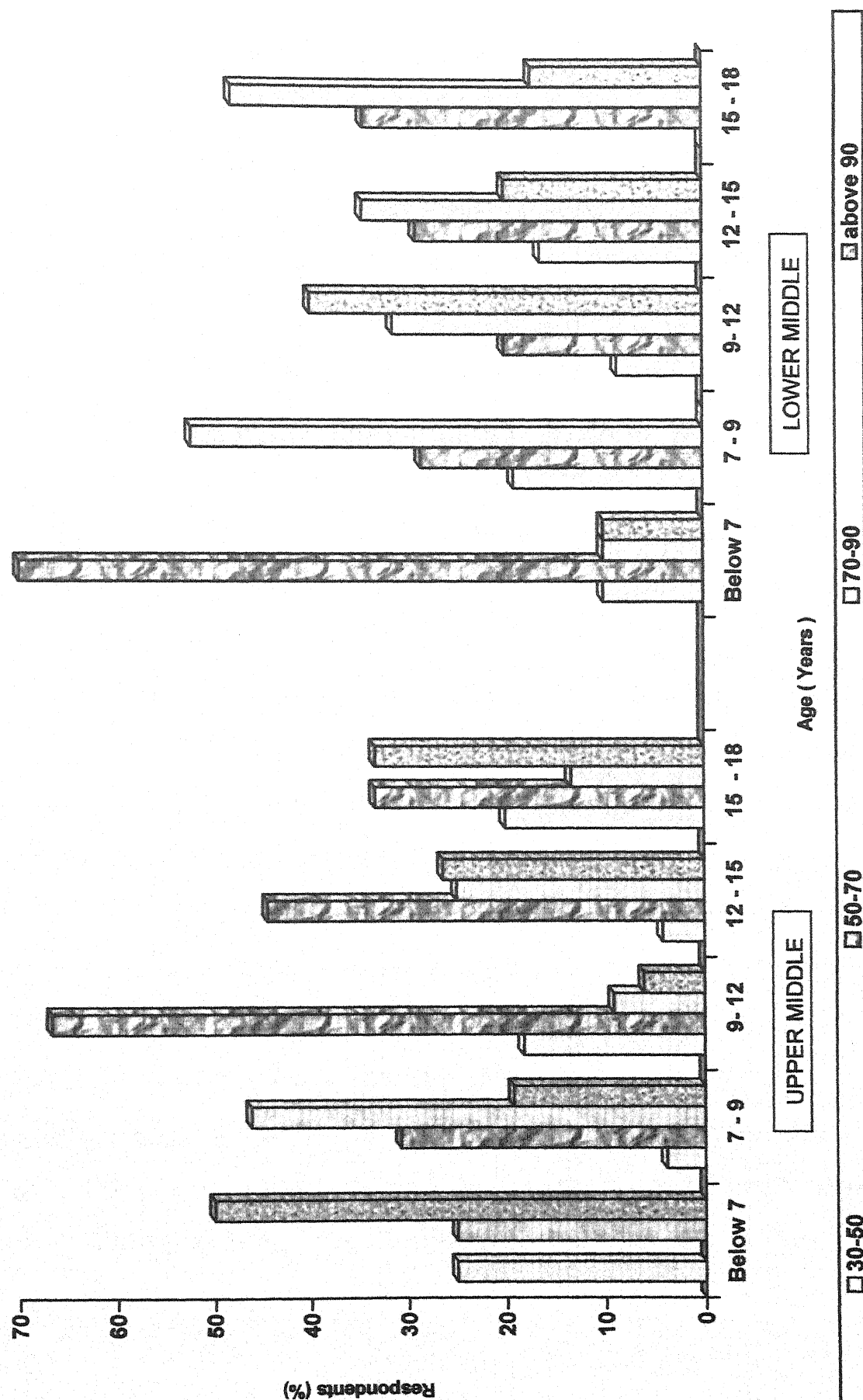
4.3.7 Distribution of respondents according to intake of roots& other vegetables

Data in Table 13 shows that, the root and other vegetables between 30-50 gm and 50-70 gm were consumed by more girl respondents of below 7 years age group in upper middle class family (23.07% and 69.23%) than those in lower middle class family (11.11% and 33.33%), while root and other vegetables between 70-90 gm were consumed by more in lower middle class family (55.66%) than in upper middle class family (9.69%). In boys, seventy percent respondents of lower middle class family were consuming vegetables between 50-70 gm. Rest of intake was more in respondents of upper middle class family .

Data further shows that, the roots and other vegetables between 30-50gm and 50-70 gm were consumed by more girls respondents of age group 7-9 years in lower middle class family (23.53% and 47.06%) than in upper middle class family (18.18% and 45.45%). Conversely, roots and other vegetables between 70-90 gm and above 90 gm were consumed by more respondents in upper middle class (31.82% and 4.55%) than those in lower middle class family (26.47% and 2.94%). In the boys, roots and other vegetables between 30-50gm and 70-90 gm were consumed by more respondents in lower middle class family (19.5% and 52.38%) than in upper middle class family (3.85% and 46.15%). Conversely between 50-70 gm was

[114]

consumed by more boys in upper middle class (30.77%) than those in lower middle class family (25.87%). Only 19.23 percent respondents of upper middle class family were consuming vegetables above 90 gm.

Results further show that in the 9-12 years age group, the vegetables between 30-50 gm were consumed by more girls in upper middle class family (18.72%) than in lower middle class family (13.79%). Rest of intake was more in lower middle class family (31.03%, 37.93% and 17.24%) than those in upper middle class family (29.73%, 35.14% and 16.22%). In boy respondents, vegetables between 30-50 gm and 50-70 gm were consumed by more boys in upper middle class family (18.18% and 66.67%) than those in lower middle class family (8.57% and 20%). Conversely vegetables between 70-90gm and above 90 gm were consumed by more respondents in lower middle class family (31.43% and 40%) than in upper middle class family (9.09% and 6.06%).

In girls respondents of age group between 12-15 years, data reveals that, the roots and other vegetables between 30-50 gm and above 90 gm were consumed by more girls in lower middle class family (8.51% and 34.04%) than in upper middle class family (7.5% and 25%), while roots and other vegetables between 50-70 gm and 70-90 gm were consumed by more in upper middle class family (32.5% and 35%) than those in lower middle class family (23.4% and 34.04%). The roots and other vegetables between 30-50 and 70-90 gm were taken by more boy respondents in lower middle class (16.36% and 34.55%) than in upper middle class family (4.17% and

[115]

25%),while vegetables between 50-70 gm and above 90 gm were taken by more boys in upper middle class family (44.44% and 26.39%) than in lower middle class family (29.09% and 20.0%).

In 15-18 years age group, roots and other vegetables between 30-50 gm were taken by more girls in upper middle class family (28.95%) than in lower middle class family (6.45%). Conversely vegetables between 50-70 gm, 70-90 gm and above 90gm were consumed by more girls in lower middle class (29.03%, 35.48% and 29.03%) than those in upper middle class family (18.42% , 31.58% and 21.05%). The intake between 30-50gm in boys respondents was seen in upper middle class family (20.0%), while roots and other vegetables between 50-70 gm and 70-90gm were consumed by more boys in lower middle class family (34.48% and 48.28%) than those in upper was family (33.33% and 13.33%), Conversely, vegetables between above 90gm was consumed by more respondents in upper middle class family (33.33%) than in lower middle class family (17.24%). (Fig. 14A, 14B).

TABLE - 14

Distribution of respondents according to the fruits intake

N=600

Age (Years)		Fruits (gm)									
		Upper Middle					Lower middle				
		Nil	50-100	100-150	150-200	200-250	Nil	50-100	100-150	150-200	200-250
below	G		7 (53.85)	5 (38.46)	1 (7.69)	-		3 (33.33)	5 (55.56)	1 (11.11)	
	B	-	-	4 (100.0)	-	-		4 (40.0)	5 (50.0)	1 (10.0)	
7 - 9	G	1 (4.55)	3 (13.64)	11 (50.0)	7 (31.82)	-		12 (35.29)	14 (41.18)	8 (23.53)	
	B		8 (30.77)	12 (46.15)	6 (23.08)	-		6 (28.57)	10 (47.62)	5 (23.81)	
9 - 12	G		10 (27.03)	12 (32.43)	15 (40.54)	-		2 (6.89)	15 (51.72)	12 (41.38)	
	B		1 (3.03)	17 (51.52)	13 (39.39)	2 (6.06)		5 (14.29)	9 (25.71)	20 (57.14)	1 (2.86)
12 -15	G		1 (2.5)	17 (42.5)	17 (42.5)	5 (12.5)		10 (21.28)	16 (34.04)	15 (31.91)	6 (12.77)
	B		1 (1.39)	23 (31.94)	34 (41.22)	14 (19.44)		4 (7.27)	26 (55.32)	21 (44.68)	4 (7.27)
15 - 18	G		2 (5.26)	14 (36.84)	17 (44.74)	5 (13.16)		10 (32.26)	9 (29.03)	10 (32.26)	2 (6.45)
	B		5 (33.33)	5 (33.33)	4 (26.67)	1 (6.67)		3 (10.34)	14 (48.28)	9 (31.03)	3 (10.34)

Figures in parenthesis indicate percentage   G - Girl   B -Boy

N = total no. of respondents

[117]

FIG. 15A : Consumption of fruits (gm) in girls.

[118]
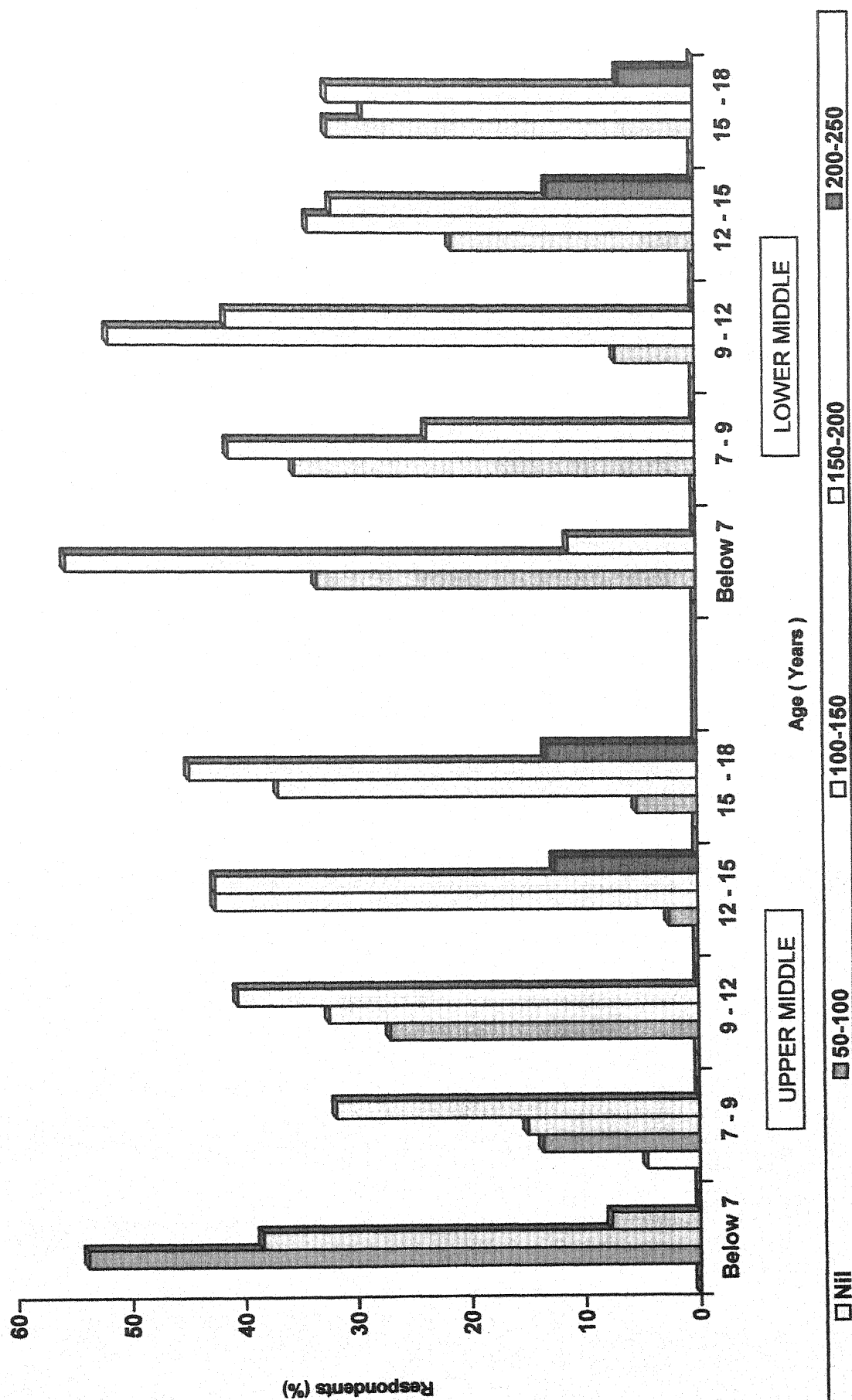
FIG. 15B : Consumption of Fruit (gm) in Boys.

Age (Years)

Respondents (%)

UPPER MIDDLE

LOWER MIDDLE

☐ Nil ■ 50-100 ☐ 100-150 ☐ 150-200 ■ 200-250

[119]

4.3.8 Distribution of respondents according to intake of fruits

Results based on consumption pattern of fruits indicate that, the fruits between 50-100gm were consumed by more girls of below 7 years old in upper middle class family (53.85%) than those in lower middle class family (33.33%) . The fruits between 100-150 gm and 150-200 gm were consumed by more girls in lower middle class family (55.56% and 11.11%) than those in upper middle class family (38.46% and 7.69%). In the boys , 100 percent respondents of upper middle class were consuming fruits between 100-150gm. In lower middle class family, 50 percent respondents were taking 100-150 gm. followed by 40 percent taking 50-100 gm and 10 percent taking 150-200 gm fruits.

Results further reveal that, fruits between 100-150 gm and 150-200gm were consumed by more girls of 7-9 years in upper middle class family (50% and 31.82%) than those in lower middle class family (41.18% and 23.53%). Conversely, fruits between 50-100 gm were consumed by more girls in lower middle class family (35.29%) than in upper middle class family (13.64%), while 4.55 percent respondents of upper middle class family were not consuming fruits. Concerning boy respondents, fruits between 50-100 gm were consumed by more boys in upper middle class family (30.77%) than those in lower middle class family (28.57%), but fruits between 100-150 gm were consumed by more boys in lower middle class family (47.62%) than those in upper

middle class family (46.15%).The intake of fruits between 150-200 gm was identical in respondents of both classes (23.08% and 23.81%).

Results further show that, the fruits between 50-100 gm were consumed by more girls of 9-12 years in upper middle class family (27.03%) than those in lower middle class family (6.89%), but fruits between 100-150gm and 150-200 gm were consumed by more respondents in lower middle class family (51.72% and 41.38%) than those in upper middle class family (32.43% and 40.54%). The fruits between 50-100 gm and 150-200 gm were taken by more boy respondents in lower middle class family (14.29 and 57.14%) than in upper middle class family (3.03% and 39.39%). Conversely fruits between 100-150 gm and 200-250 gm were taken by more boys in upper middle class family (51.52% and 6.06%) than those in lower middle class family (25.71% and 2.86%).

In girls of 12-15 years age group, the fruits between 50-100gm were consumed by more girls in lower middle class family (21.28%) than those in upper middle class family (2.5%), but fruits between 100-150 gm and 150-200 gm were consumed by more respondents in upper middle class family (42.5%) than in lower middle class family (34.04% and 31.91%), while consumption between 200-250 gm was almost same in respondents of both classes (12.5% and 12.77%). Concerning boys, fruits between 50-100 gm and 100-150 gm were consumed by more boys in lower middle class family (7.27% and 55.32%) than those in upper middle class family (1.39 % and 31.94%), but fruits between 150-200 gm and 200-250gm were consumed by

[121]

more respondents in upper middle class family (47.22% and 19.44%) than in lower middle class family (44.68% and 7.27%).

Concerning 15-18 years age group, the fruits between 50-100 gm were consumed by more girls in lower middle class family (32.26%) than those in upper middle class family (5.26%), but fruits between 100-150gm, 150-200 gm and 200-250gm were taken by more girls in upper middle class (36.84%, 44.74% and 13.16%) than those in lower middle class family (29.03%, 32.26% and 6.45%). In the boys, trend was just opposite. (Fig.15A, 15B)

TABLE - 15

Distribution of respondents according to the milk & milk products intake

N=600

Age (Years)		Milk & milk products(ml.)									
		Upper middle					Lower middle				
		Nil	below100	100-200	200-300	300-400	Nil	below100	100-200	200-300	300-400
below 7	G	-	2 (15.38)	8 (61.54)	3 (23.08)	-	-	3 (33.33)	5 (55.56)	1 (11.11)	
	B		1 (25.0)	2 (50.0)	1 (25.0)	-	-	-	6 (60.0)	4 (40.0)	
7 - 9	G	1 (4.55)	4 (18.18)	15 (68.18)	2 (9.09)	-	-	8 (23.53)	15 (44.12)	11 (32.35)	
	B		4 (15.38)	8 (30.77)	14 (53.85)	-	1 (4.76)	4 (19.05)	13 (61.09)	3 (14.29)	
9 - 12	G	1 (2.7)	4 (10.81)	17 (45.95)	15 (40.54)	-	2 (6.89)	5 (17.24)	16 (55.17)	6 (20.69)	
	B	-	1 (3.03)	16 (48.48)	16 (48.48)	-	1 (2.86)	4 (11.43)	16 (45.71)	13 (37.14)	1 (2.86)
12 -15	G	2 (5)	11 (27.5)	15 (37.5)	12 (30.0)	-	1 (2.13)	11 (23.4)	15 (31.91)	19 (40.43)	1 (2.13)
	B	5 (6.94)	9 (12.5)	26 (36.11)	24 (33.33)	8 (11.11)	-	5 (9.09)	21 (38.18)	23 (41.82)	6 (10.9)
15 - 18	G	1 (2.63)	5 (13.16)	18 (47.37)	12 (31.58)	2 (5.26)	1 (3.23)	3 (9.68)	11 (35.48)	16 (51.61)	-
	B	-	2 (13.33)	7 (46.67)	6 (40.0)	-	-	-	19 (65.52)	8 (27.59)	2 (6.89)

Figure in parenthesis indicate percentage
N = total no. of respondents
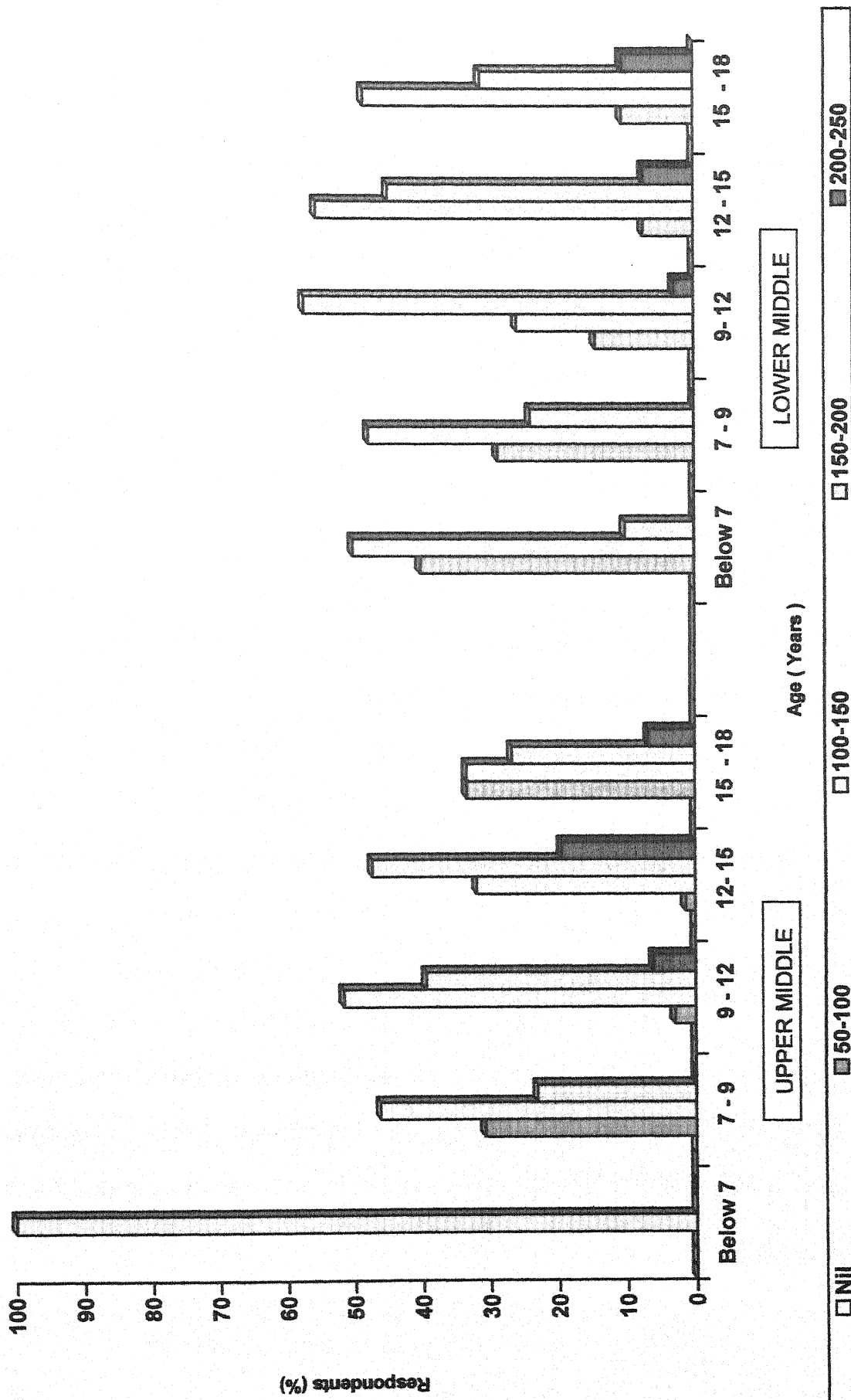
G - Girl   B -Boy

[123]

FIG. 16A : Consumption of Milk & milk products (gm) in girls.

UPPER MIDDLE

LOWER MIDDLE

Age (Years)

Respondents (%)

Nil   below 100   100-200   200-300   300-400

[124]
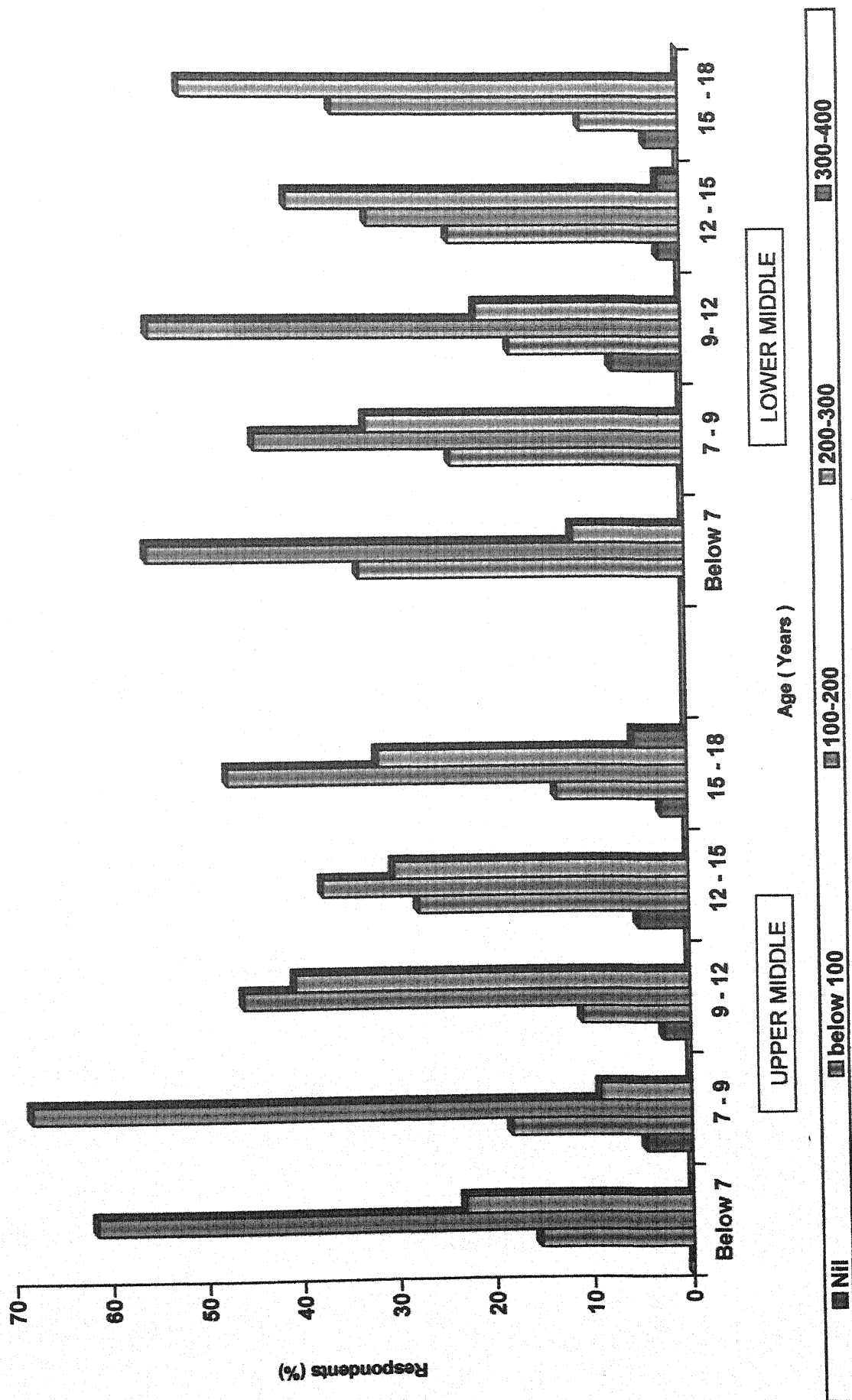
FIG. 16B : Consumption of Milk & milk products (gm) in boys.

[125]
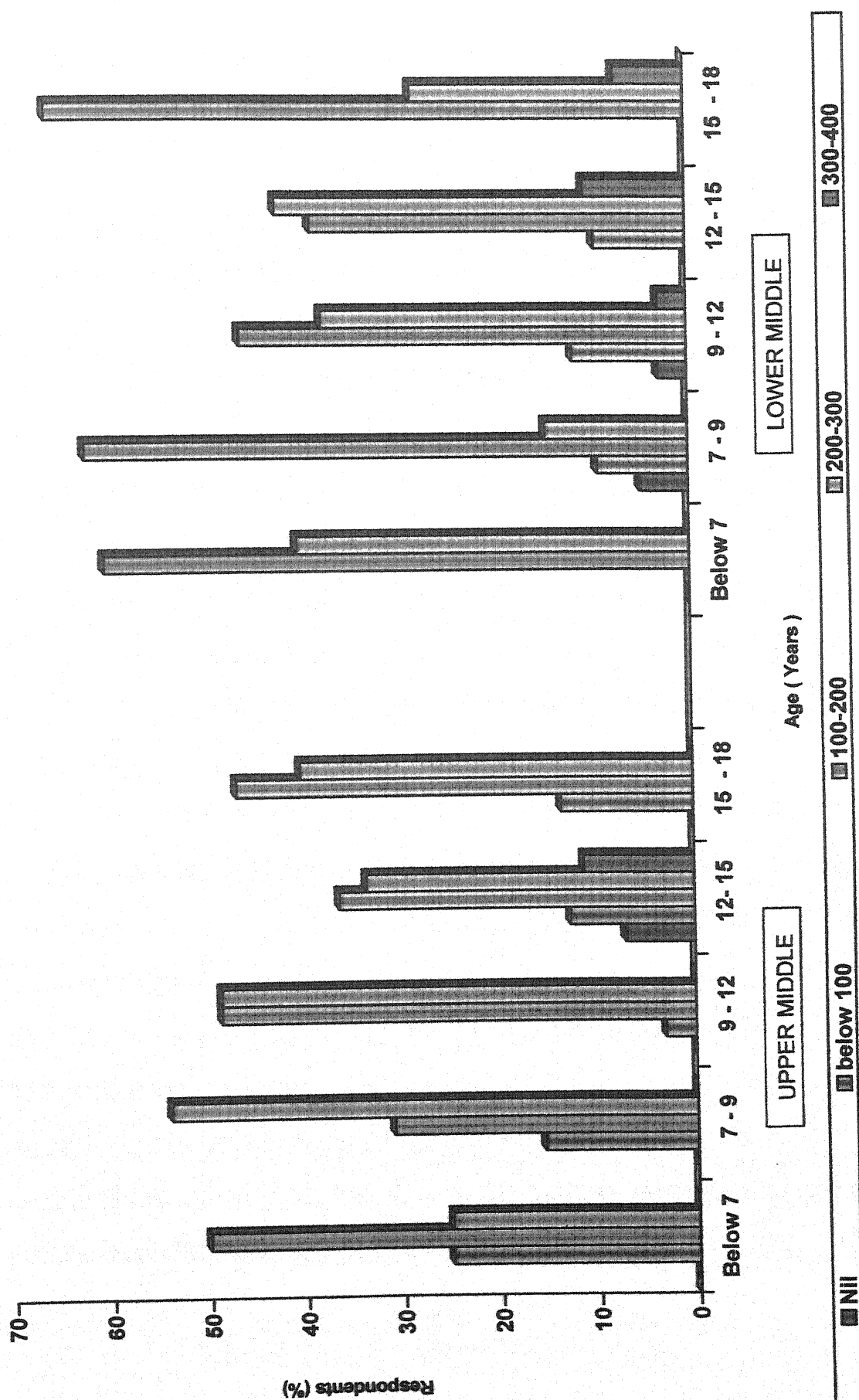
4.3.9 Distribution of respondents according to Milk Consumption

Results tabulated in Table 15 show that, the milk below 100ml was consumed by more girls of below 7 years age group in lower middle class family (33.33%) than those in upper middle class family (15.38%).The milk between 100-200ml and 200-300 ml was consumed by more girls in upper middle class family (61.54% and 23.08%) than those in lower middle class family (56.56% and 11.11%). In the boys, milk between 100-200 ml and 200-300 ml was consumed by more respondents in lower middle class (60% and 40%) than in upper middle class family (50% and 25%), but intake below 100 ml was seen in boys of upper middle class family (25%).

The milk below 100ml and between 200-300ml was consumed by more girls respondents of 7-9 years in lower middle class family (23.53% and 32.35%) than those in upper middle class family (18.18% and 9.09%). The milk between 100-200 ml was consumed by more girls in upper middle class family (68.18%) than those in lower middle class family (44.12%), while 4.55 percent respondents of upper middle class were not taking milk . In the boys, milk below 100ml and 100-200 ml was consumed by more boys in lower middle class family (19.05% and 61.9%) than those in upper middle class family (15.38% and 30.77%). Conversely milk between 200-300 ml was consumed by more respondents in upper middle class family (53.85%) than in lower middle class family (14.29%). Only 4.76 percent respondents of lower middle class family were not consuming milk.

[126]

Results further show that , in the age group between 9-12 years , milk below 100ml and between 100-200 ml was consumed by more girls in lower middle class family (17.24% and 55.17%) than in upper middle class family (10.81% and 45.95%). Conversely, milk between 200-300 ml was consumed by more girls in upper middle class family (40.54%) than those in lower middle class family (20.69%), while 2.7% respondents of upper middle class and 6.89% respondents of lower middle class were not taking milk., The milk below 100ml was consumed by more boys in lower middle class family (11.43%) than those in upper middle class family (3.03%). Conversely, milk between 100-200ml and 200-300ml was consumed by more respondents in upper middle class family (48.48% respectively) than in lower middle class family s(45.71% and 37.14%), while 2.86 percent respondents were taking milk between 300-400 ml and 2.86 percent were not taking milk.

Data on consumption pattern of milk and milk products further indicates that, the milk below 100ml and 100-200 ml was consumed by more girls of 12-15 years age group in upper middle class family (27.5% and 37.5%) than those in lower middle class family (23.4% and 31.91%), but milk between 200-300 ml was consumed by more girls in lower middle class family (40.43%) than those in upper middle class family (30%), while 5 percent respondent of upper middle class and 2.13 percent respondents of lower middle class were not taking milk. The intake of milk between 300-400 ml was seen only in respondent of lower middle class family (2.13%). Regarding boys , the milk below

[127]

100 ml and 300 - 400 ml was consumed by more boys in upper middle class family (12.5% and 11.11%) than in lower middle class family (9.09% and 10.9%). Conversely, milk between 100-200 ml and 200-300 ml was consumed by more respondent in lower middle class family (38.18% and 41.82%) than those in upper middle class family (36.11% and 33.33%). Only 6.94 percent respondents of upper middle class family were not taking milk.

In the 15-18 years age group, the milk below 100ml and 100-200 ml was taken by more girls in upper middle class family (13.16% and 47.37%) than in lower middle class family (9.68% and 35.48%). The milk between 200-300 ml was consumed by more girls in lower middle class family (51.61%) than those in upper middle class family (31.58%). Milk consumption was negligible in 2.63 percent and 3.23 percent respondents of upper and lower middle class family, respectively. The intake of milk between 300-400 was seen in respondents of upper middle class family (5.26%). In the boys, milk between 100-200 ml was consumed by more boys in lower middle class family (65.52%) than in upper middle class family (46.67%). Conversely, milk between 200-300 ml was consumed by more boys in upper middle class family (40%) than in lower middle class family (27.55%), while 13.33 percent respondents of upper middle class and 6.89percent respondents of lower middle class were taking milk below 100 ml and between300-400 ml, respectively. (Fig. 16A, 16B)

TABLE - 16

Consumption of different nutrients in comparison with daily allowances of ICMR for obese respondents

N=28

Age (Years)		Calories(kcal.)	Actual Intake		Protein (gm)	Actual Intake		Fat(gm)	Actual Intake	
		R.D.A.	Upper middle	lower Middle	R.D.A.	Upper middle	lower Middle	R.D.A.	Upper middle	lower Middle
Below 7	G	1690	1805	-	30	38	-	25	23	-
	B	1690	-	-	30	-	-	25	-	-
7 - 9	G	1950	1692	2015	41	45	35.5	25	22.33	18.5
	B	1950	1894	1876	41	32	42	25	18.5	19
9 - 12	G	1970	1978	2042.5	57	49.67	47.5	22	21.67	21
	B	2190	1906	2071.5	54	45.5	53.5	22	18	23
12 - 15	G	2060	2235	-	65	59	-	22	27	-
	B	2450	2343	2313	70	56.75	42	22	20.35	18
15 - 18	G	2060	2045	1943	63	56.5	61	22	23.5	26
	B	2640	-	2370	78	-	63	22	-	29

Figures in parenthesis indicate percentage G - Girl   B - Boy

N = total no. of respondents

[129]

Fig. 17A : Average calories (kcal.) intake of obese respondents of upper middle & lower middle class.

Respondents (%)

Age (Years)

GIRLS

BOYS

Below 7 7 - 9 9 - 12 12 - 15 15 - 18 Below 7 7 - 9 9 - 12 12 - 15 15 - 18

R.D.A.   Upper middle   Lower Middle

[130]
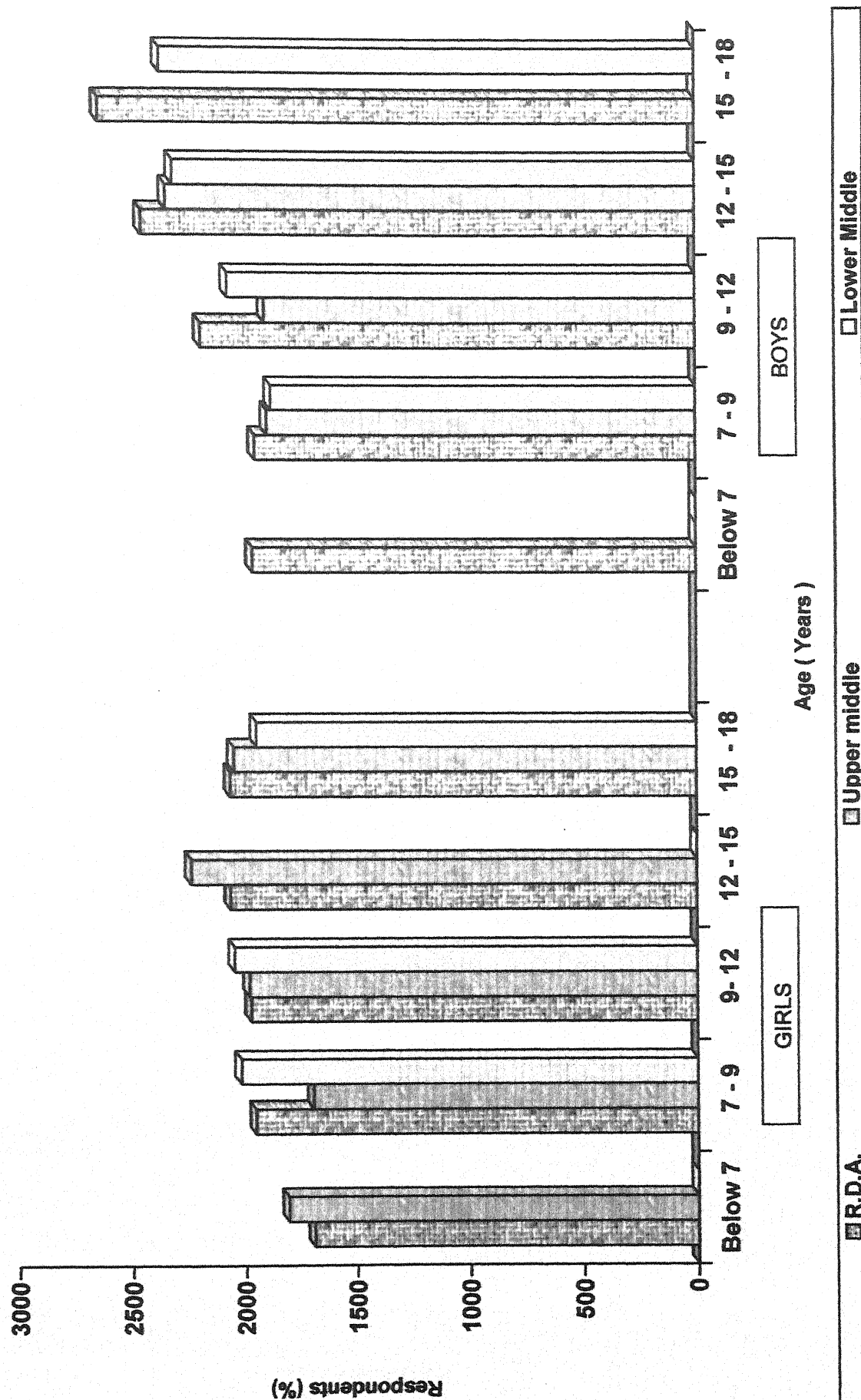
Fig. 17B : Average protein (gm) intake of obese respondents of upper middle & lower middle class.

Respondents (%)

Age (Years)

GIRLS

BOYS

Below 7   7 - 9   9 - 12   12- 15   15 - 18   Below 7   7 - 9   9 - 12   12 -15   15 - 18

R.D.A.   Upper middle   Lower middle

[131]
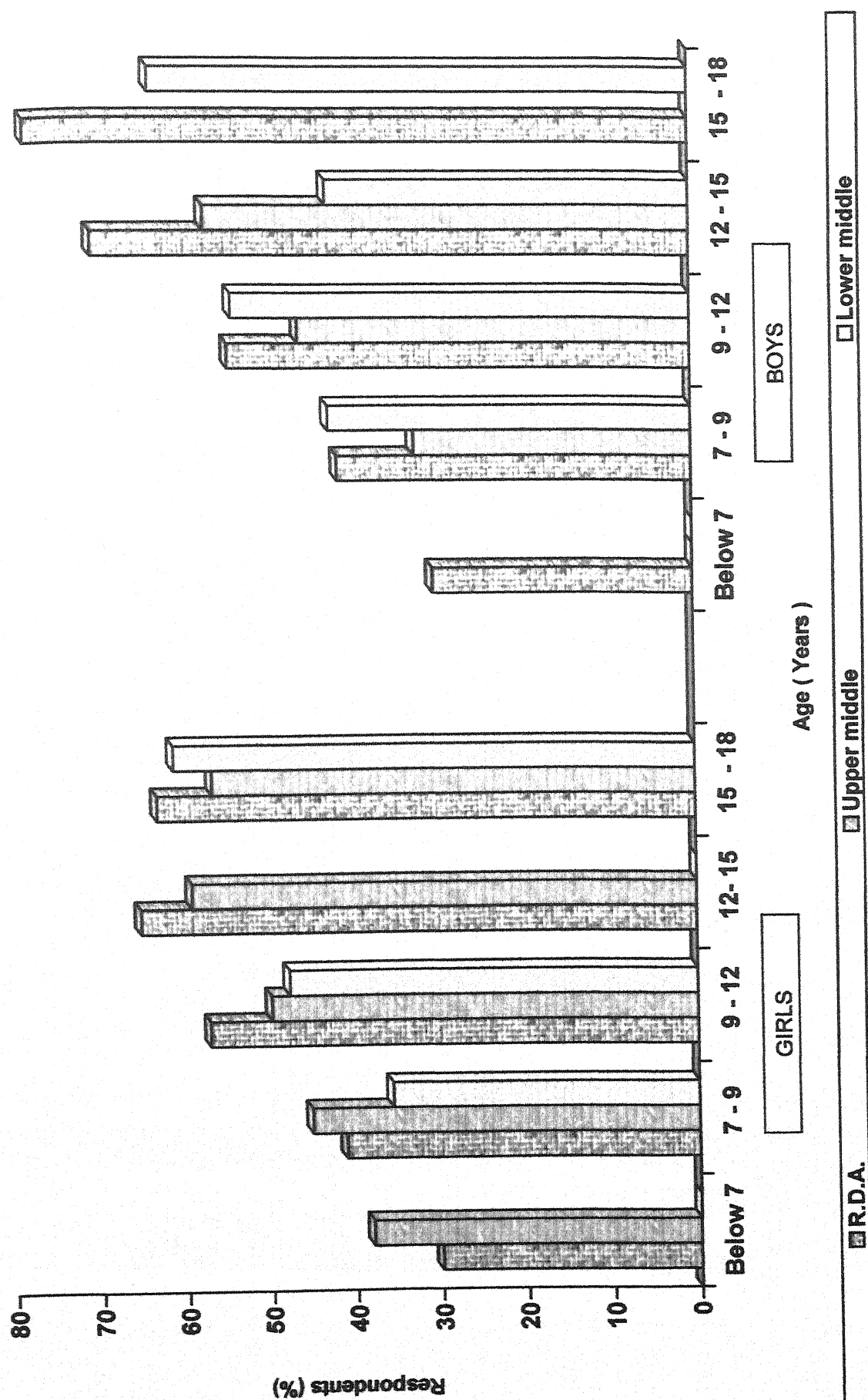
Fig. 17C : Average fat intake of respondents of upper middle & lower middle class.

Respondents (%)

Age (Years)

GIRLS

BOYS

☒ R.D.A.   ☐ Upper middle   ☐ Lower middle

[132]
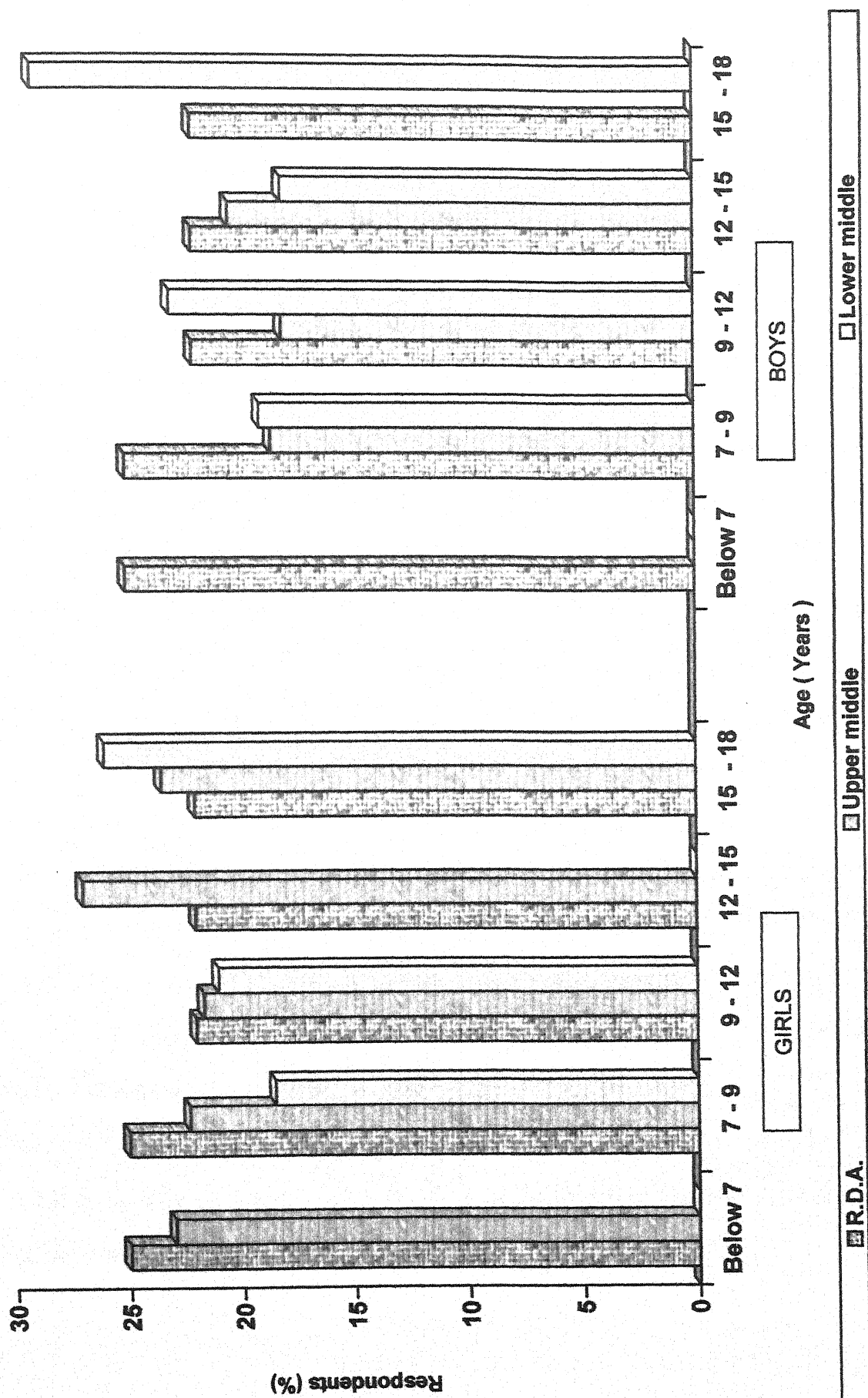
4.3.10 Average daily intake of nutrients for obese respondents of upper middle and lower middle class.

The results presented in table 16 indicate that respondents of upper middle class below 7 years of age, consumed more calories (1805), and protein (58 gm) than the R.D.A, while the fat consumption was lower in respondents of lower middle class than the R.D.A..

In 7-9 years age group, the calories intake was less in upper class girls (1692) and more in lower middle class (2015) than the R.D.A. Contrary to this, intake of protein was higher in upper middle class (45) and lower in lower middle class (35.5) than the R.D.A. However the intake of fat was lower in both the classes (upper middle - 22.33 & lower middle - 18.5), while in boys of both classes intake of calories (upper middle - 1894 and lower middle - 1876) was lower than the R.D.A. Consumption of protein was more (42) in lower middle class and less in upper middle class (32) than the R.D.A. On the other hand fat intake in both the groups was lower (18.5 and 19.07) than the R.D.A.

Consumption of calories in girls of 9-12 years age group of both classes was higher (upper middle - 1978 and lower middle 2042) than the R.D.A., while protein and fat intake was lower in both groups (upper middle - 49.67 and 21.67, lower middle - 47.5 and 21). In boys , calories intake was lower in both groups (upper middle - 1906 and lower middle 2071.5) than the R.D.A. Protein and fat intake of upper middle class was lower (45.5 & 18) , while intake of these nutrients in lower middle class was at par with the R.D.A (53.5 & 23).

[133]

Regarding calories consumption in girls of 12-15 years age group , it was observed that girls of upper middle class were consuming more calories (2235) and fat (27) but less protein (59) than R.D.A. Conversely boys of both groups consumed less energy (upper middle - 2343 and lower middle - 2313), protein (upper middle - 56.75 and lower middle - 42) and fat. (upper middle - 20.35 and lower middle - 18) than the R.D.A.

Intake of calories and protein was less (upper middle - 2045 & 56.75 , lower middle - 1943 & 61) while that of fat was more (upper middle - 23.5 & lower middle - 26) in girls of 15-18 years age group. Similar trend in the intake of calories, protein and fat was observed in boys of lower middle class (Fig. 17A,17B, 17C).

The reasons for such results may be diets higher in fat, increased consumption of animal products, superior grain, sugar and larger quantities of processed foods and meals, eaten out side the home. Urban environment is also associated with less physical activity and lack of exercise opportunities and facilities.

TABLE- 17

Prevalence of obesity in upper middle and lower middle class respondents based on independent variables

N=600

Variables	Total no. of respondents		No. of obese respondents		Prevalence rate	
	Upper-middle	lower-Middle	Upper-middle	lower-Middle	Upper-middle	lower-Middle
Occupation						
Business	145	120	11	7	7.6	5.8
Service	116	147	5	3	4.3	2.0
Agriculture	3	11	2	-	5.6	-
Others	36	22	-	-	-	-
Physical activity						
Game- Yes	117	142	8	4	4.5	2.8
No	123	158	10	6	8.1	3.8
Exercise - Yes	93	57	4	1	4.3	1.7
No	207	243	14	9	6.8	3.7
Type of family						
Joint	125	110	11	5	8.8	4.5
Nuclear	175	190	7	5	2.9	2.6
Encouraged by food advertisement						
Yes	213	144	13	6	6.1	4.2
No	87	156	5	4	5.7	2.7
Extra meal						
Yes	225	108	15	5	6.7	4.6
No	75	192	3	5	4.0	2.6

Fig. - 18   Factors affecting prevalence of obesity.

B - Business
S - Service
A - Agriculture
Y - Yes
N - No
J.F. - Joint Family
N.F. - Nuclear Fan

Upper Middle

Lower Middle

Factors

Prevalence rate (%)

Occupation   Games Physical Activity   Exercise   Type of family   Encouraged By food   Extra meal   Occupation   Games Physical Activity   Exercise   Type of family   Encouraged By food   Extra meal

[136]
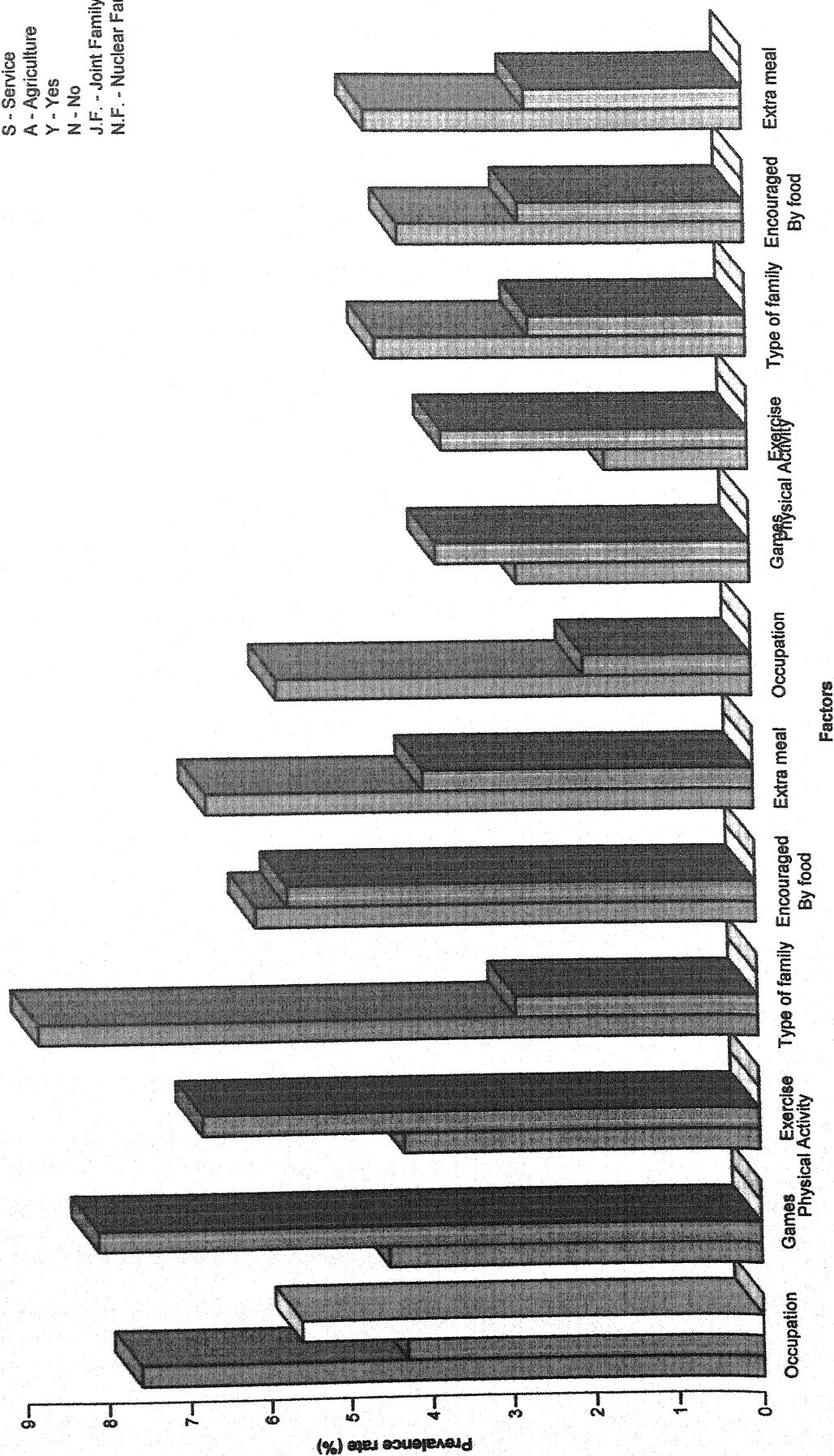
4.4 Prevalence of obesity in respondents based on independent variables

Results in Table 17 indicate that in upper middleclass family, business affects more the prevalence of obesity (7.6%) followed by agriculture (5.6%) and service (4.3%), while in lower middle class family, prevalence rate was more in business (5.8%) followed by service (2%). Regarding physical activity majority of respondents of upper middle class family who were not engaged in physical activity showed more obese nature (games-8.1% and exercise-6.8%). Similar trend was found in respondents of lower middle class family. Concerning type of family, joint family affects more the prevalence of obesity in upper middle class family (8.8%) followed by nuclear family (2.9%). Trend was similar in lower middle class family. Food advertisement showed more effect on prevalence of obesity in both upper middle and lower middle class family (6.1% and 4.2%). Extra meal showed more effect in upper middle class family (6.7%). (Fig. 18)

From the above, it can be concluded that prevalence rate of different factors was more in upper middle class family. All the factors are correlated with each other. These respondents due to their business give more sitting, do less physical activities and take extra meal which results in gaining more weight it can be concluded children from affluent section are frequenting fast food joints more often, engaged in indoor activities like watching television and

computer games. With affluence, their is a tendency to enhance consumption of costly fatty and oily items. This leads to positive calorific balance in children eating more calories and burning less.

Besides, most of the children skip their morning breakfast as they have to leave for school early. In the school, they consume oily canteen stuff.

TABLE - 18

Prevalence rate of obesity in respondents of Jhansi city

N=600

Age (Years)	n	Obese	Prevalence Rate
below 7	36	1	2.8
7 - 9	103	8	7.8
9- 12	134	9	6.7
12 - 15	214	6	2.8
15 - 18	113	4	3.5
TOTAL	600	28	4.7

N = Total no. of respondents

Fig. : 19 Prevalence rate of obesity in Jhansi city.
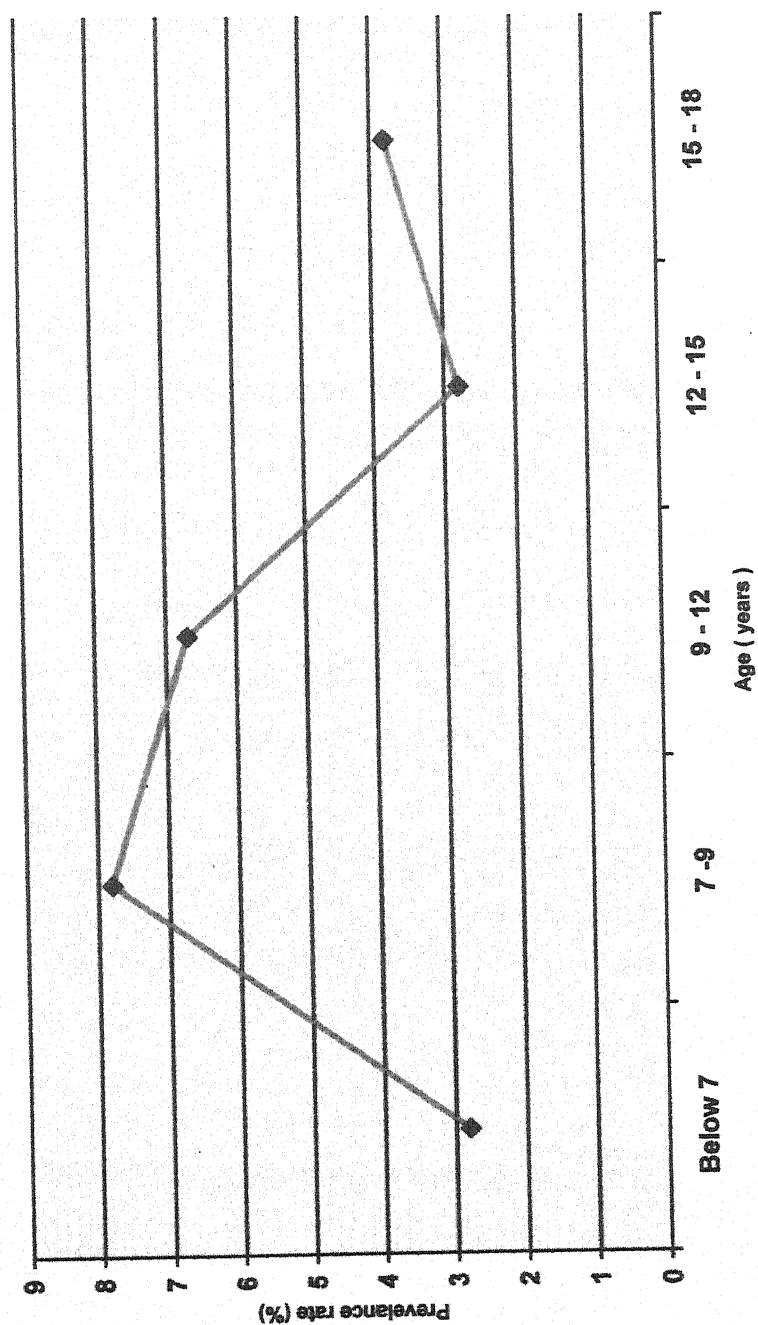
4.5 Prevalence rate of obesity in respondents of Jhansi city.

Data shows that prevalence of obesity in respondents of 7 -9 years age group was 7.8 percent followed by 6.7 percent in 9-12 years , 3.5 percent in 15-18 years and 2.8 percent in 12-15 years & 7 years age group respectively .Total prevalence rate was 4.7 percent. (Fig. 19)

Conclusion may be derived that prevalence rate of obesity is found more in 7-12 years age group, The reason may be that during this period children are more attracted towards fast foods, cold drinks, chocolate, ice-cream etc. They become more aware and want to become more independent, which makes them stubborn. Due to this parents have to fulfill their desires whether it is beneficial for their health or not. The minimum obesity was found in children of below 7 years age group. This may be due to the reason that the children are under control of parents. And regarding their awareness regarding the causes of obesity, they were more aware but did not pay any attention toward it.

TABLE - 19

Prevalence rate of obesity in respondents of upper middle & lower middle class

N=600

Age (Years)	Upper Middle			lower middle		
	n	Obese	Prevalence Rate	n	Obese	Prevalence Rate
below 7	17	1	5.9	19	-	0.0
7 - 9	48	5	10.4	55	3	5.5
9- 12	70	5	7.1	64	4	6.3
12 - 15	112	5	4.5	102	1	0.98
15 - 18	53	2	7.8	60	2	3.3
TOTAL	300	18	6.0	300	10	3.3

Figures in parenthesis indicate percentage
N = Total no. of respondents

[142]

Fig. : 20 Prevalence rate of obesity in respondents of upper middle & lower middle class

[143]
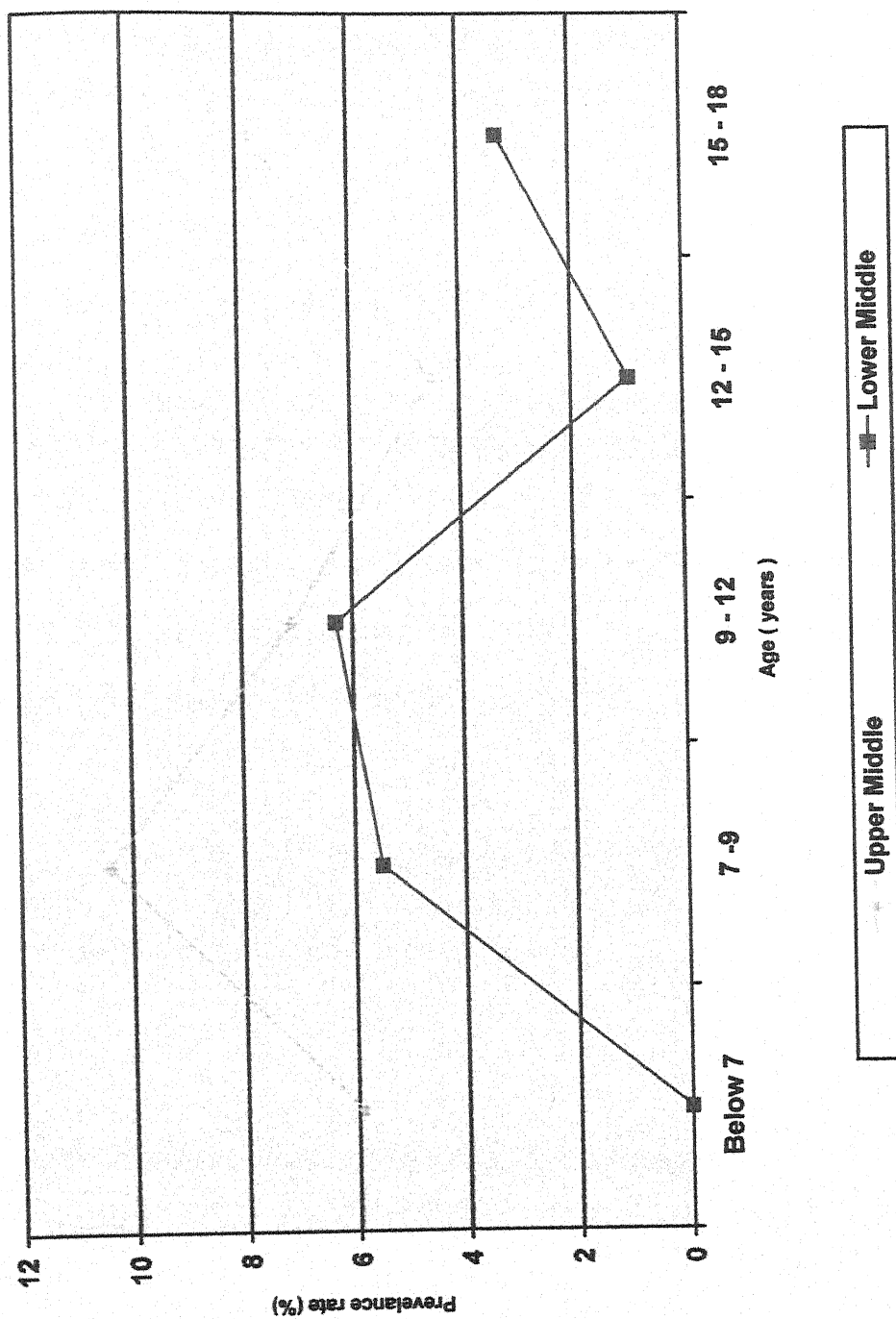
4.5.1 Prevalence rate of obesity in children of upper middle and lower middle class

Data reveals that prevalence of obesity in respondents of age group below 7 years was 5.9% in upper middle class family. In 7-9 years age group, the prevalence rate was more in respondents of upper middle class family (10.4%) than in lower middle class family (5.5%). Similar trend was found in 9-12 years, 12-15 years and 15-18 years age group. (Fig. 20)

The reason for such results might be that guardians of upper middle class family do not give proper attention to their children which makes the child to feel independent. They take the love of their parents for granted even for their wrong act, while in lower middle class family, parents give proper attention, don't allow them in any wrong act, don't let them free concerning extra meals and these children more engaged in outdoor activities.

TABLE - 20

Prevalence rate of obesity in girls of upper middle & lower middle class

N=300

Age (Years)	Girls					
	Upper middle			lower middle		
	n	Obese	Prevalence Rate	n	Obese	Prevalence Rate
below 7	13	1	7.7	9	-	-
7 – 9	22	3	13.6	34	2	5.8
9- 12	37	3	8.1	29	2	6.9
12 - 15	40	1	2.5	47	-	-
15 - 18	38	2	5.3	31	1	3.2
TOTAL	150	10	6.7	150	5	3.3

Figures in parenthesis indicate percentage
N = Total no. of respondents

Fig. : 21 Prevalence rate of obesity in girls of both groups

[146]
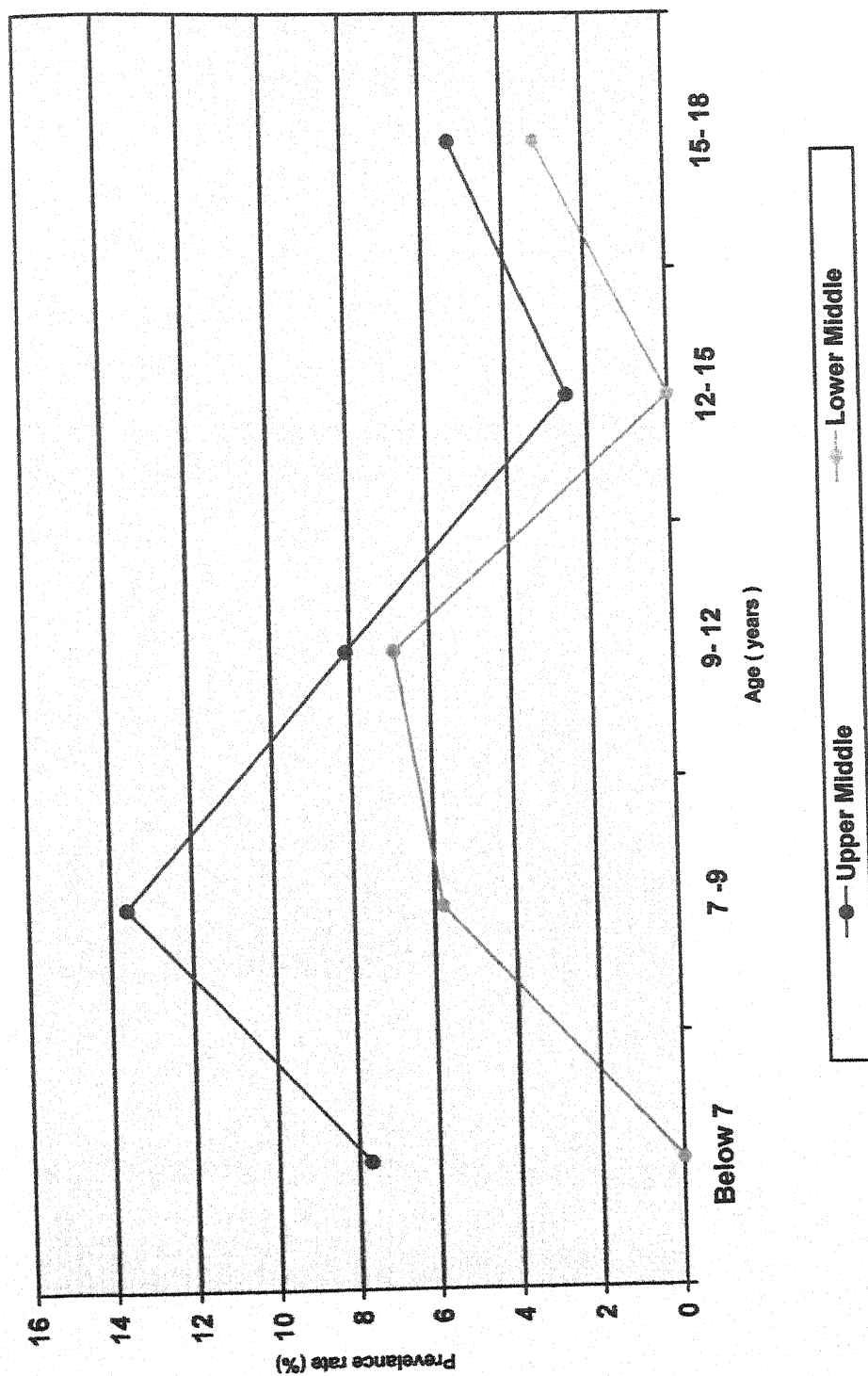
4.5.2 Prevalence rate of obesity in girls of both groups

Data in table20 shows that prevalence of obesity in respondents of below 7 years age group was 7.7% in upper middle class family. In the 7-9 years age group, prevalence rate was more in upper middle class (13.6%) than in lower middle class family (5.8%). Similar trend was seen in 9-12 years and 15-18 years age group; while in 12-15 years age group, prevalence rate was 2.5 percent in upper middle class family. (Fig. 21)

Results of Table 20 conclude that prevalence of obesity is more prevalent in upper middle class family, which may be due to the reason that girls of upper middle class family do not engage them self in house hold activities and their diet contains more snacks.

TABLE - 21

Prevalence rate of obesity in boys of upper middle & lower middle class

N=300

Age (Years)	Boys					
	Upper middle			lower middle		
	n	Obese	Prevalence Rate	n	Obese	Prevalence Rate
below 7	4	-	-	10	-	-
7 – 9	26	2	7.7	21	1	4.7
9 - 12	33	2	6.1	35	2	5.7
12 - 15	72	4	5.5	55	1	1.8
15 - 18	15	-	-	29	1	3.4
TOTAL	150	8	5.3	150	5	3.3

Figures in parenthesis indicate percentage
N = Total no. of respondents

Fig. : 22 Prevalence rate of obesity in boys of both groups.

[149]
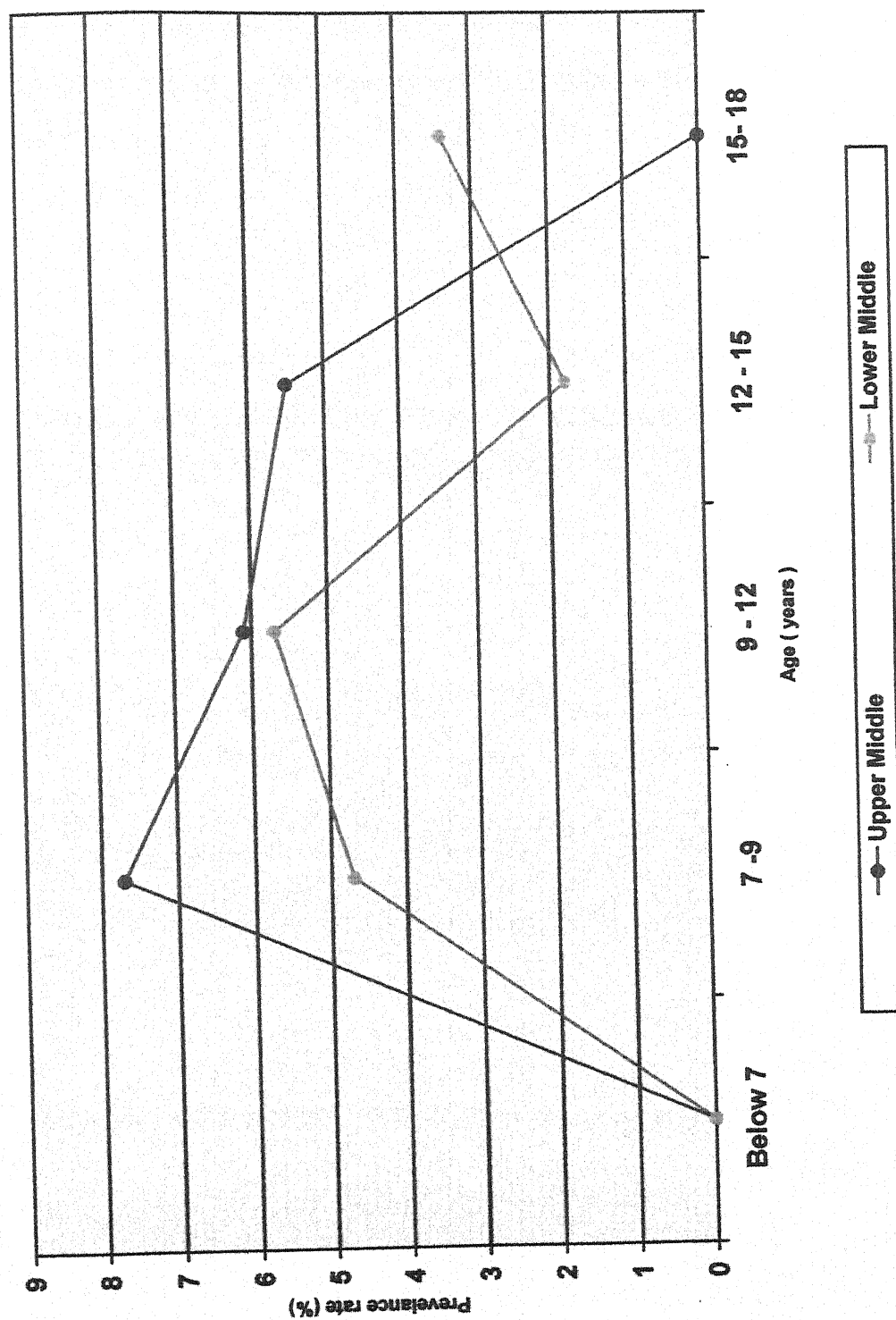
4.5.3 Prevalence rate of obesity in boys of both groups

Data in Table 21 indicate that prevalence rate was negligible in respondents of below 7 years age group of both class family. Concerning 7-9 years age group, prevalence rate was more in upper middle class (7.7%) than in lower middle class family (4.7%). Similar trend was found in 9-12 years and 12-15 years age group. While in the 15-18 years age group, prevalence of obesity was seen only in lower middle class family (3.4%). (Fig. 22)

Conclusion may be derived that prevalence of obesity is more common in boys of upper middle class family as these boys are facilitated by vehicles, extra money freedom etc. Due to extra money they want to utilize that money in different facilities, which reduces their walking and other physical activities.

TABLE - 22

Anthropometrics measurements of obese and non-obese respondents'

Body Measurements (mean)	Boys		Test of Significance		Girls		Test of Significance	
	Obese (n=13)	Non obese (n=287)	T	P	Obese (n=15)	Non Obese (n= 285)	T	P
Height (Cm)	144.31	144.71	0.44	NS	133.83	135.31	0.169	NS
Weight (kg)	67.88	48.70	6.48	*	57.00	41.41	0.488	*
Mid - upper arm circumference (cm)	25.00	19.96	0.48	*	24.62	20.00	0.23	NS
Skin fold thickness (mm)	17.62	14.70	0.46	*	7.81	10.2	-	-

◆ Obesity by calculated by using BMI Criterion.

* Significant at P < 0.05 level.

4.6 Anthropometric measurements in obese and non obese respondents of both sexes.

The data was analyzed concept wise to assess the comparison of anthropometric measurements of obese and non-obese respondents. Frequency, percentage and their 't' values were calculated for each body measurement.

Height

Data presented in table 24 reveals that the 't' value (0.44) of boys showed non-significant difference between obese and non-obese respondents.

The table further indicate that the 't' value (0.169) of girls showed non-significant difference between obese and non-obese respondents.

Weight

The 't' value (0.48) of boy respondents showed significant difference between obese and non obese respondents.

The table further revealed that the 't' value (0.488) of girls showed significant difference between obese and non-obese respondents.

Mid upper arm circumference

The 't' value (0.48) of boy showed significant difference between obese and non-obese respondents but 't' value of (0.23) of girl respondents showed non–significant difference between obese and non-obese respondents.

Triceps Skin fold thickness

The 't' value (0.46) of boy respondents showed significant difference between obese and non-obese respondents.

Above details indicate that there is no well defined trend as for as the anthrometric measurement of obese and non-obese respondents is concerned. Some factor show a significant difference whereas some don't. For a further insight into this some other test like chi-square, etc. have been employed.

TABLE - 23

Association between age and obesity in children of upper middle & lower middle class

Status	χ^2 Calculated	χ^2 tabulated		Degree of freedom	Inference
		(5%)	(1%)		
Upper middle					
Girls	3.099599	9.49	13.28	4	N.S.
Boys	1.39954	9.49	13.28	4	N.S.
lower middle					
Girls	4.2298972	9.49	13.28	4	N.S.
Boys	1.5201377	9.49	13.28	4	N.S.

4.7 Association between age and obesity.

Null hypothesis- There is no association between obesity and age of the respondents.

The significance of this hypothesis was tested by chi-square value. In the above table, it can be seen that the calculated chi-square value for the present sample is less than the tabulated value at .05 and .01 level of significance. This means that there is significant difference between Age & Obesity. Hence the null hypothesis is accepted, which means , that there exist no association between obesity and age of respondents.

[154]

TABLE - 24

Co-relation between food stuffs (dietary nutrients) intake and weight of respondents

Values of Co-relation coefficient (r) for food stuffs and nutrients intake versus weight		
Calories (kcal.)	Protein (gm)	Fat (gm)
0.168643	0.130858	0.35049
Cereals (gm)	Pulses (gm)	Green leafy vegetables (gm)
0.114324	-0.157211	-0.029387
Roots & Other Vegetables (gm)	Fruits (gm)	Milk (ml)
0.064176	-0.008726	0.011765

4.8 Co-relation between food stuffs (dietary nutrients) intake and weight of respondents

In the table 24 , values of correlation coefficients have been tabulated against various variable. It can be seen that the value is positive in some cases whereas it has negative value in others. As is clear , the value of r for food stuffs like cereals , pulses , etc has been obtained as either negative or of very small magnitude nearing zero, showing there by that each of these food stuffs above do not have any correlation with the weight of the respondents. However, average calorie intake and protein intake show a small positive correlation with the weight. But, fat intake seems to the most deciding factor in deciding the obesity of the respondents as the value of r (=0.25) is significantly positive.

[155]

TABLE - 25

Association between independent variables and prevalence of obesity

S. No.	Variable	Degree of Freedom	χ^2 calculated		χ^2 tabulated (5%)	Inference
			Upper middle	lower middle		
1.	Occupation	3	1.4381	4.220567	11.341	S
2	Physical activity :- a. Games b. Exercise	1 1	1.6948534 0.6897677	0.223925 0.54446	6.635 6.635	S
3	Type of family	1	2.978722	0.7964606	6.635	S
4	Encouraged by food advertisement	1	0.0138926	1.5705	6.635	S
5	Extra meal	1	0.709213	0.7700233	6.635	S

4.9 Association between independent variables and Extents of obesity

The association between both dependent and independent variables based on chi-square test values indicate, that occupation (upper middle - 1.4381, lower middle - 4.220567) Physical activity (games - upper middle - 1.6948534, lower middle 0.223925, exercise - upper middle 0.6897677 and lower middle 0.54446) type of family (upper middle 2.978722 , lower middle 0.7964606) encouraged by food advertisement (upper middle 0.0138926 , lower middle 1.5705) and extra meal (upper middle 0.709213 , lower middle 0.7700233) are associated with prevalence of obesity in respondents of both class families.

[156]

Chapter - 5

Summary & Conclusion

SUMMARY AND CONCLUSION

Obesity has become a global epidemic affecting the lives and health of millions of people, according to the World Health Organization. It is an accelerating social problem in industrialized countries and is also growing in the former colonial world.

In the media obesity is typically characterized as an eating disorder or merely an individual problem. But with over half the adult population now obese or overweight in major countries, and the obesity rate rising sharply for adults and children alike during the 1990s, such simplistic approaches serve to obscure the underlying social causes. Childhood obesity is already epidemic in some areas and on the rise in others. An estimated 17.6 million children under five are estimated to be overweight world wide. The prevalence of obese children aged 6 to 11 years has more than doubled since the 1960s. Obesity prevalence in youths aged 12-17 has increased dramatically from 5% to 13% in boys and from 5% to 9% in girls between 1966-70 and 1988-91 in the USA. The problem is global and increasingly extends into the developing world; for example, in Thailand the prevalence of obesity in 5 to 12 years old children rose from 12.2% to 15-6% in just two year. During the past 20 years, prevalence of obesity among children and adolescents have doubled in America . The United States National Center for Health Statistics suggests that nearly 15% adolescents are overweight or obese. A study conducted in 1990 amongst 3,861 school children reported the prevalence of obesity as

[157]

7.5%. In 2000, 38.8 million American adults met the classification of obesity, defined as having a body mass index (BMI) of 30 or more & prevalence of obesity was 19,8% which reflects a 61 % increase since 1991. An International Obesity Task Force (IOTF) analysis has shown that overweight and obesity affects once in 10 children worldwide, but the rate is double in Europe and three times as great across the entire Americas.

Most of the studies conducted across the society on prevalence of obesity revealed that genetic dietary pattern and economic strata are the key factors for its genesis. Inception of luxuries item, indoor entertainment and playing objectives in the upper affluent society seems to be other factors contributing to obesity problem. Contribution of these factors to obesity in children of economically which people has not been studies adequately.

Thus the present study was under taken with the following specific objectives as the result of study might pin point the relative contribution of these factors to obesity.

OBJECTIVES

1. To identify the Nutritional status of Affluent children in Jhansi city.

2. To assess the impact of the dietary pattern on the prevalence of obesity in children of affluent society in Jhansi city.

3. To find out the factors responsible for the prevalence of obesity.

4- To compare the prevalence of obesity between the children of upper middle class families and lower middle class families in Jhansi city.

METHODOLOGY

Locale of Study

For carrying out the present study, Jhansi city was selected purposively as the locale of the study .

Sampling procedure:

Selection of site:

A list of different schools of Jhansi city was prepared. From this list, 2 private and 2 government schools were randomly selected.

Selection of respondent : - The random list of school children in the age group 6-17 years from 4 schools was prepared. These school children were equally divided into two groups i.e upper middle class and lower middle class. 300 children each from upper middle class and lower middle class family, were purposively selected. The children of both the groups were further subdivided into equal number of boys and girls. Thus, 600 respondents from Jhansi city were selected.

Development & pre -testing of questionnaire :

A well structured questionnaire related to socio-economic status and 24 dietary recall was prepared.

Variables and their measurements :-

Independent Variables :- Independent variables included socio personal and family variables of – Age, Sex, Education of respondent,

Religion, Food Habits, Education of Parents, Occupation of Head of the family, Type of Family, Status of family, Total Income of the family, Physical Activity, Food advertisement, Extra Meal.

Dependent variables :- Prevalence of obesity in 6-17 years old children of affluent society of Jhansi city was taken as dependent variable under different subheads :-

Data Collection :

After selecting the sample and deciding the tools and techniques for data collection the investigator visited the schools & semi structured - pre-tested questionnaire was administered to each child to collect data on socio demographic profile (age, sex, socio-economic status). Dietary patterns and nutrient intake. Anthropometrics measurements of weight, standing height, mild upper aim circumference (M.U.A.C.) and triceps skin fold thickness (T.S.F.T.), were measured by utilizing standard methodology. The collected data were scrutinized, coded, quantified , tabulated and compiled systematically to commensurate with the objectives of the study to draw influences . Appropriate statistical tools and tests were applied to draw inference - *percentage , mean ,*paired t - test , Chi Square Test.

RESULTS & DISCUSSION

Respondents profile

Socio personal variables of respondents - Most of the boys respondents of upper middle class and lower middle class were in the age category of 12-15 years .Most of the girls respondents of the upper middle class and lower middle class, were in the age category of

12-15 years . Most of the boys respondents of upper middle class and lower middle class, were in the VII- IX standard Similar trend of school standard was found for girls respondents. Most of the respondents of upper middle class and lower middle class belongs to Hindu religion followed by Muslim. Similar trend of religion was found for girls respondents of both classes. The food habits of the respondents showed that most of the boys respondents of upper middle class were in the category of eggetarians followed by Non-egetarian . Most of the boys respondents of lower middle class, were egetarian followed by vegetarian . Similar trend was found in girls of both classes,

Family variables of respondents -

Regarding the education of parents, most of the parents of both sexes were graduate followed by postgraduate. While in the both sexes of lower middle class family, most of the parents were graduate followed by post graduate. Regarding the Occupation of the respondents father, half of the respondents father of both sexes were engaged in business in upper middle class family followed by service The respondents' father of both sexes in lower middle class family were engaged in service followed by Business .Regarding family type variable, most of the respondents of both sexes of upper middle class family and lower middle class family belong to nuclear family . In the upper middle class family, most of the respondents of both sexes had family income ranging between Rs. 15,000- 20,000 followed by Rs. 20,000 .While in the lower middle class family, ,most of the

[161]

respondents of both sexes had family income ranging between Rs.10,000 - 15,000 followed by Rs.15,000-20,000

Nutritional status of respondents of Jhansi city.

Most of the respondents of below 7 years age group were Normal weight followed by overweight Similar trend was seen in respondents of all age groups .

Distribution of respondents of upper middle class & lower middle class family according to nutritional status

Normal weight respondents of below 7 years age group were more in lower middle class than in upper middle class family, while over weight respondents were more in upper middle class than in lower middle class family . Underweight respondents were identical in both class and obese respondents were found only in upper middle class family .Concerning 7-9 years age group, underweight, Normal weight and overweight respondents were more in lower middle class than in upper middle class family while obese respondents were more in upper middle class than in lower middle class family. Underweight, overweight and obese respondents of 9-12 years age group were more in upper middle class than in lower middle class family. But normal weight respondents were more in lower middle class than in upper middle class family. Similar trend was found for respondents of 12-15 years age group and 16-17 years age group.

Nutritional status of girls of both groups.

Normal weight respondents of below 7 years age group were more in lower middle class family than in upper middle class family .

[162]

Conversely over weight respondents were more in upper middle class family than in lower middle class family . Under weight and obese respondents were found in upper middle class family. In the 7-9 years age group, under weight and obese respondents were more in upper middle class family than in lower middle class family . While normal weight and over weight respondents were more in lower middle class than in upper middle class family . Normal weight respondents of 9-12 years age group were more in lower middle class than in upper middle class family . But over weight and obese respondents were more in upper middle class than in lower middle class family .Under weight respondents were found in upper middle class family. In the 12-15 years age group, under weight and over weight respondents were more in upper middle class than in lower middle class family . While normal weight respondents were more in lower middle class than in upper middle class family . Only respondents of upper middle class were obese. Under weight , over weight and obese respondents of 15-18 years age group were more in upper middle class family than in lower middle class family .Normal weight respondents were more in lower middle class than upper middle class family .

Nutritional status of boys of both groups.

Normal weight and over weight respondents of below 7 years age group were more in upper middle class than in lower middle class family . While under weight respondents were found in lower middle class family .In the 7-9 years age group, under weight respondents were more in lower middle class family than in upper middle class

[163]

family. Conversely normal weight, over weight and obese respondents were more in upper middle class family than in lower middle class family. Underweight, over weight and obese respondents of 9-12 years age group were more in upper middle class than in lower middle class family, while normal weight respondents were more in lower middle class than in upper middle class family. Similar trend was seen in respondents of 12-15 years age group. Normal weight and over weight respondents of 15-18 years age group were more in upper middle class than in lower middle class family. While underweight and obese respondents were seen only in lower middle class family.

Daily Intake of calories in respondents of upper middle and lower middle class

In the age group below 7 years, the calories between 1000 - 1500 kcal were consumed by more girls in lower middle class than those in upper middle class, while calories between 1500-2000 kcal. were taken by more respondents in upper middle class than in lower middle class In the boys , the trend was similar.

In the 7-9 years age group, the calories between 1000-1500 kcal and 1500-2000Kcal were consumed by more girls in upper middle class family than those in lower middle class. The intake between 2000-2500 Kcal was seen only in lower middle class family respondents. The calories between 1000-1500 Kcal were consumed by more boys in lower middle class than those in upper middle class. The calories between 1500-2000 Kcal were taken by more respondents in upper middle class than in lower middle class, but

intake between2000-2500 Kcal was seen only in respondents of lower middle class family .

The calories between 1000-1500 Kcal were consumed by more girls of 9-12 years age group in lower middle class than those in upper middle class . The calories between 1500-2000 Kcal were taken by more respondents in upper middle class than those in lower middle class, while intake between 2000-2500kcal. was identical in respondents of both classes. The calories between 1000-1500 Kcal were consumed by more boys in lower middle class than those in upper middle class family, while calories between 1500-2000 Kcal and 2000- 2500 kcal were consumed by more boys in upper middle class than those in lower middle class family.

The calories intake between 1000-1500 kcal in girls of age group 12-15 years was almost same in both family classes. The calories between 1500-2000 Kcal were consumed by more respondents in lower middle class than those in upper middle class family ,but calories between 2000-2500 Kcal were taken by more girls in upper middle class than those in lower middle class family . In the boy respondents, the calories between 1000-1500 Kcal and 1500-2000 kcal. were consumed by more boys in lower middle class than those in upper middle class, while calories between 2000-2500 and 2500-3000 kcal were consumed by more respondents in upper middle class than those in lower middle class family.

In the 15-18 years age group, calories between 1000-1500 Kcal and 2000-2500 Kcal were consumed by more girls in lower middle

[165]

class than those in upper middle class. The calories between 1500-2000 Kcal were consumed by more respondents in upper middle class than those in lower middle class. In the boys, intake between 1500-2000 Kcal was identical in respondents of both family classes. The calories between 2000-2500 kcal. were consumed by more boys in upper middle class than those in lower middle class family. Conversely calories between 2500-3000 Kcal were taken by more respondents in lower middle class than in upper middle class family. The calories intake between 1000 -1500 kcal. was seen only in lower middle class respondents.

Daily Intake of protein in respondents of upper middle and lower middle class

In the age group of below 7 years, the Protein below 30 gm was consumed by more girls in upper middle class than those in lower middle class ,while protein between 30-50 gm was taken by more respondents in lower middle class than in upper middle class family. Similar trend was found in boy respondents.

In the 7-9 years age group, the Protein below 30gm was consumed by more girls in lower middle class than in upper middle class family. Conversely protein between 30-50 gm & 50-70 gm was consumed by more respondents in upper middle class than in lower middle class family. In the boys, Protein below 30 gm & 30-50 gm was consumed by more respondents in upper middle class than in lower middle class family. But protein between 50-70 gm was taken by more boys in lower middle class than those in upper middle class family.

The protein below 30 gm and 30-50 gm was consumed by more girls of 9-12 years age group in upper middle class than those in lower middle class family, but protein between 50-70 gm was consumed by more respondents in lower middle class than those in upper middle class. Protein below 30 gm was consumed by more boys in upper middle class than in lower middle class but protein between 30-50 gm & 50-70 gm was taken by more respondents in lower middle class than those in upper middle class family . The intake between 70-90 gm was identical in both classes.

In the 12-15 years age group, the Protein below 30 gm , between 50-70 gm and 70-90 gm was consumed by more girls in lower middle class than those in upper middle class family. Conversely protein between 30-50 gm was taken by more respondents in upper middle class than those in lower middle class. Concerning boys respondents, the Protein between below 30 gm and 30-50 gm was consumed by more boys in lower middle class than in upper middle class family , but protein between 50-70 gm and 70-90 gm was consumed by more respondents in upper middle class than in lower middle class family .

The protein between below 30 gm and 50-70 gm was consumed by more girls of 15-18 years age group in lower middle class than those in upper middle class, while protein between 30-50 gm and 70-90 gm was consuming by more respondents in upper class than those in lower middle class family. Concerning boys, the protein between 30-50 gm and 50-70 gm was consumed by more respondents in lower middle class than those is upper middle class, but protein between 70-

[167]

90 gm was taken by more boys in upper class than in lower middle class family.

Daily Intake of fat in respondents of upper middle and lower middle class

The fat between 10-20 gm was consumed by more girls of age group below 7 years in upper middle class than in lower middle class, but fat between 20-30 gm was consumed by more girls in lower middle class than those in upper middle class . Concerning boys, fat between 10-20gm was consumed by more respondents in lower middle class than in upper middle class. Conversely fat between 20-30 gm was consumed by more boys in upper middle class than in lower middle class.

The fat below 10 gm and between 20-30 gm was consumed by more girls of age group 7-9 years in lower middle class than those in upper middle class, but fat between 10-20 was consumed by more girls in upper middle class than in lower middle class. In the boys, fat below 10 gm and between 20-30 gm was consumed by more respondents in upper middle class than those in lower middle class. The fat between 10-20 gm was consumed by more boys in lower middle class than in upper middle class.

In 9-12 years age group, the fat below 10 gm and 20-30 gm was consumed by more girls in lower middle class than those in upper middle class family. Conversely fat between 10-20 gm was consumed by more respondents in upper middle class than in lower middle class. Similar trend was found in boy respondents.

[168]

The fat below 10 gm and between 20-30 gm was consumed by more girl respondents of age group 12-15 years in lower middle class than in upper middle class family, but fat between 10-20 gm was taken by more respondents in upper middle class than in lower middle class. Similar trend was seen in boy respondents.

Concerning 15-18 years age group, the fat below 10 gm was consumed by more girls in lower middle class than in upper middle class, but fat between 10-20 gm and 20-30 gm was consumed by more respondents in upper middle class than in lower middle class . The consumption between 30-40 gm was seen in respondents of only upper middle class family. Regarding boys, fat below 10 gm and between 20-30 gm was consumed by more respondents in lower middle class than in upper middle class, while fat between 10-20 gm was consumed by more boys in upper middle class than in lower middle class family.

Distribution of respondents according to intake of cereals

The cereals between 100-200 gm were consumed by more girls of below 7 years age group in lower middle class than in upper middle class, but cereals between 200-300 gm were consumed by more respondents in upper middle class than in lower middle class. Concerning boy respondents, 50 percent were taking cereals between 100-200 gm and rest 50 percent were taking cereals between 200-300 gm in upper middle class family .

In the age group of 7-9 years, cereals between 100-200 gm were consumed by more girls in upper middle class than those in lower

middle class, but cereals between 300-400 gm were consumed by more respondents in lower middle class than those in upper middle class .The intake between 200-300 gm was identical in both classes . The cereals between 100-200 gm was consumed by more boys in upper middle class than in lower middle class, while cereals between 200-300 gm and 300-400 gm were consumed by more respondents in lower middle class than in upper middle class family.

The cereals between 100-200 gm and 200-300 gm were consumed by more girl of 9-12 years age group in upper middle class than in lower middle class . However, cereals between 300-400 gm and 400-500 gm were consumed by more respondents in lower middle class than in upper middle class family. The cereals between 200-300 gm were consumed by more boys in upper middle class than in lower middle class , while cereals between 100-200 gm, 300-400 gm and 400-500 gm were taken by more respondents in lower middle class than in upper middle class family.

In the 12-15 years age group, the cereals between 200-300 were consumed by more girls in lower middle class than in upper middle class. The cereals between 300-400 gm were consumed by more girls in upper middle class than in lower middle class family. Only 5.0percent girls of upper middle class were taking cereals between 100-200 gm , while intake level between 400-500 gm was identical in both family classes.

In girl respondents of age group between15-18 years , the cereals between 100-200 gm, 200-300 gm and 300-400 gm were

[170]

consumed by more girls in upper middle class than those in lower middle class family . Conversely, cereals between 400-500 gm were consumed by more respondents in lower middle class than in upper middle class, while in boys, the cereals between 200-300 gm, 300-400 gm and above 500 gm were consumed by more respondents in upper middle class than in lower middle class family, but cereals between 400-500 gm were consumed by more boys in lower middle class than those in upper middle class family .

Distribution of respondents according to intake of pulses

The pulses between 20-40 gm were consumed by more girls of below 7 years age group in upper middle class than in lower middle class but pulses between 40-60 gm were consumed by more respondents in lower middle class than in upper middle class. Concerning boys, pulses below 20 gm and 40-60 gm were consumed by more boys in upper middle class than in lower middle class. Conversely pulses between 20-40 gm were consumed by more respondents in lower middle class than in upper middle class .

The pulses below 10 gm and 20-40 gm were consumed by more girls of 7-9 years in lower middle class than in upper middle class .The pulses between 40-60 gm and 60-80 gm were consumed by more respondents in upper middle class than those in lower middle class. In the boy respondents, pulses between 20-40 gm were taken by more boys in upper middle class than in lower middle class, but pulses between 40-60 gm and 60-80 gm were consumed by more

respondents in lower middle class than in upper middle class. The intake below 20 gm was seen only in upper middle class family.

In the 9-12 years age group, the pulses below 20 gm and 20-40 gm were taken by more girls in upper middle class than those in lower middle class. The pulses between 40-60 gm and 60-80 gm were consumed by more girls in lower middle class than in upper middle class family. In boys, pulses between 20-40 gm was consumed by more respondents in upper middle class than those in lower middle class, but rest of intake was more in respondents of lower middle class than those in upper middle class family.

The pulses below 20 gm and between 60-80 gm were consumed by more girls of 12-15 years in lower middle class than in upper middle class family, Conversely, pulses between 20-40 gm and 40-60 gm were consumed by more respondents in upper middle class than those in lower middle class family. Concerning boy respondents, the pulses I between 20-40 gm and 40-60 gm were consumed by more boys in upper middle class than those in lower middle class, but intake between 40-60gm and above 80 gm were taken by more respondents in lower middle class than in upper middle class family. The intake below 20 gm was found only in boys of upper middle class family .

In 15-18 years age group, the pulses between 40-60 gm and 60-80gm were consumed by more girls in upper middle class than those in lower middle class, but pulses between 20-40 gm and above 80 gm were consumed by more respondents in lower middle class than in upper middle class. The pulses between 20-40 gm were consumed by

more boys in upper middle class than in lower middle class, but pulses between 40-60 gm and 60-80 gm were consumed by more boys in lower middle class than in upper middle class. The intake of pulses above 80 gm was seen only in lower middle class respondents .

Distribution of respondents according to intake of green leafy-vegetables

In the below 7 years age group, green leafy vegetables below 50gm were consumed by more girls in upper middle class than in lower middle class family, while green leafy vegetables between 50-100 gm and 100-150 gm were consumed by more respondents in lower middle class than those in upper middle class family. In the boy respondents, the green leafy vegetables below 50 gm were consumed by more boys in upper middle class than those in lower middle class .Conversely, green leafy vegetables between 50-100 gm were consumed by more respondents in lower middle class family than in upper middle class family . Only 10 percent respondents of lower middle class family were not consuming green leafy vegetables.

The green leafy vegetables below 50gm was consumed by more girls of age group 7-9 years in upper middle class than in lower middle class, while between 50-100 gm was consumed by more girls in lower middle class than those in upper middle class family . In the boys, green leafy vegetables below 50gm were taken by more boys in upper middle class than in lower middle class but between 50-100 gm were taken by more respondents in lower middle class than those in upper middle class family

[173]

In the 9-12 years age group, the below 50 gm and between 50-100 gm were consumed by more girls in upper middle class than in lower middle class family, but green leafy vegetable between 100-150gm were consumed by more respondents in lower middle class than in upper middle class family . Concerning boys, vegetables below 50gm and 50-100 gm were consumed by more boys in lower middle class than in upper middle class family. Conversely, green leafy vegetables between 100-150 gm were consumed by more boys in upper middle class than in lower middle class family .

In 12-15 years age group, green leafy vegetables below 50gm and between 50-100 gm were consumed by more girls in lower middle class than in upper middle class family, but vegetable between 100-150 gm were consumed by more respondents in upper middle class than in lower middle class family. In the boys, green leafy vegetables below 50gm and between 100-150 gm were consumed by more respondents in lower middle class family than those in upper middle class family , but vegetable between 50-100 gm were consumed by more boys in upper middle class than in lower middle class family .

In the 15-18 years are group, green leafy vegetables below 50 gm, 50-100 gm and 100-150 gm were consumed by more girl respondents in upper middle class than those in lower middle class family. Conversely, vegetables between 150-200 gm were consumed by more girls in lower middle class than those in upper middle class family. In the boys, green leafy vegetables below 50 gm were consumed by more respondents of lower middle class than in upper

middle class family , whereas vegetables between 50-100 gm were consumed by more boys in upper middle class than those in lower middle class family. The consumption between 100-150 gm was found only in respondents of upper middle class family.

Distribution of respondents according to intake of roots& other vegetables

The root and other vegetables between 30-50 gm and 50-70 gm were consumed by more girl respondents of below 7 years age group in upper middle class family than those in lower middle class family, while root and other vegetables between 70-90 gm were consumed by more in lower middle class family than in upper middle class family. In boys, seventy percent respondents of lower middle class family were consuming vegetables between 50-70 gm. Rest of intake was more in respondents of upper middle class family .

The roots and other vegetables between 30-50gm and 50-70 gm were consumed by more girls respondents of age group 7-9 years in lower middle class family than in upper middle class family . Conversely, roots and other vegetables between 70-90 gm and above 90 gm were consumed by more respondents in upper middle class than those in lower middle class family. In the boys, roots and other vegetables between 30-50gm and 70-90 gm were consumed by more respondents in lower middle class family than in upper middle class family. Conversely between 50-70 gm was consumed by more boys in upper middle class than those in lower middle class family.

[175]

In the 9-12 years age group, the vegetables between 30-50 gm were consumed by more girls in upper middle class family than in lower middle class family . Rest of intake was more in lower middle class family than those in upper middle class family. In boy respondents, vegetables between 30-50 gm and 50-70 gm were consumed by more boys in upper middle class family than those in lower middle class family . Conversely vegetables between 70-90gm and above 90 gm were consumed by more respondents in lower middle class family than in upper middle class family.

In the age group between 12-15 years, the roots and other vegetables between 30-50 gm and above 90 gm were consumed by more girls in lower middle class family than in upper middle class family, while roots and other vegetables between 50-70 gm and 70-90 gm were consumed by more in upper middle class family than those in lower middle class family. The roots and other vegetables between 30-50 and 70-90 gm were taken by more boy respondents in lower middle class than in upper middle class family ,while vegetables between 50-70 gm and above 90 gm were taken by more boys in upper middle class family than in lower middle class family .

In 15-18 years age group, roots and other vegetables between 30-50 gm were taken by more girls in upper middle class family than in lower middle class family. Conversely vegetables between 50-70 gm, 70-90 gm and above 90gm were consumed by more girls in lower middle class than those in upper middle class family . The intake between 30-50gm in boys respondents was seen in upper middle

class family, while roots and other vegetables between 50-70 gm and 70-90gm were consumed by more boys in lower middle class family than those in upper was family, Conversely, vegetables between above 90gm was consumed by more respondents in upper middle class family than in lower middle class family .

Distribution of respondents according to intake of fruits

The fruits between 50-100gm were consumed by more girls of below 7 years old in upper middle class family than those in lower middle class family. The fruits between 100-150 gm and 150-200 gm were consumed by more girls in lower middle class family than those in upper middle class family. In the boys , all the respondents of upper middle class were consuming fruits between 100-150gm. In lower middle class family, half of the respondents were taking 100-150 gm. followed by 50-100 gm and 150-200 gm fruits.

The fruits between 100-150 gm and 150-200gm were consumed by more girls of 7-9 years in upper middle class family than those in lower middle class family. Conversely, fruits between 50-100 gm were consumed by more girls in lower middle class family than in upper middle class family, while 4.55 percent respondents of upper middle class family were not consuming fruits. Concerning boy respondents, fruits between 50-100 gm were consumed by more boys in upper middle class family than those in lower middle class family , but fruits between 100-150 gm were consumed by more boys in lower middle class family than those in upper middle class family. The intake of

[177]

fruits between 150-200 gm was identical in respondents of both classes .

The fruits between 50-100 gm were consumed by more girls of 9-12 years in upper middle class family than those in lower middle class family, but fruits between 100-150gm and 150-200 gm were consumed by more respondents in lower middle class family than those in upper middle class family. The fruits between 50-100 gm and 150-200 gm were taken by more boy respondents in lower middle class family than in upper middle class family . Conversely fruits between 100-150 gm and 200-250 gm were taken by more boys in upper middle class family than those in lower middle class family .

In girls of 12-15 years age group, the fruits between 50-100gm were consumed by more girls in lower middle class family than those in upper middle class family, but fruits between 100-150 gm and 150-200 gm were consumed by more respondents in upper middle class family than in lower middle class family, while consumption between 200-250 gm was almost same in respondents of both classes. Concerning boys, fruits between 50-100 gm and 100-150 gm were consumed by more boys in lower middle class family than those in upper middle class family, but fruits between 150-200 gm and 200-250gm were consumed by more respondents in upper middle class family than in lower middle class family.

Concerning 15-18 years age group, the fruits between 50-100 gm were consumed by more girls in lower middle class family than those in upper middle class family, but fruits between 100-150gm, 150-

[178]

200 gm and 200-250gm were taken by more girls in upper middle class than those in lower middle class family . In the boys, trend was just opposite.

Distribution of respondent according to intake of Milk

The milk below 100ml was consumed by more girls of below 7 years age group in lower middle class family than those in upper middle class family. The milk between 100-200ml and 200-300 ml was consumed by more girls in upper middle class family than those in lower middle class family. In the boys, milk between 100-200 ml and 200-300 ml was consumed by more respondents in lower middle class than in upper middle class family , but intake below 100 ml was seen in boys of upper middle class family.

The milk below 100ml and between 200-300ml was consumed by more girls respondents of 7-9 years in lower middle class family than those in upper middle class family. The milk between 100-200 ml was consumed by more girls in upper middle class family than those in lower middle class family . In the boys, milk below 100ml and 100-200 ml was consumed by more boys in lower middle class family than those in upper middle class family . Conversely milk between 200-300 ml was consumed by more respondents in upper middle class family than in lower middle class family.

In the age group between 9-12 years , milk below 100ml and between 100-200 ml was consumed by more girls in lower middle class family than in upper middle class family. Conversely, milk between 200-300 ml was consumed by more girls in upper middle

class family than those in lower middle class family, The milk below 100ml was consumed by more boys in lower middle class family than those in upper middle class family. Conversely, milk between 100-200ml and 200-300ml was consumed by more respondents in upper middle class family than in lower middle class family.

The milk below 100ml and 100-200 ml was consumed by more girls of 12-15 years age group in upper middle class family than those in lower middle class family, but milk between 200-300 ml was consumed by more girls in lower middle class family than those in upper middle class family. The intake of milk between 300-400 ml was seen only in respondent of lower middle class family (2.13%). Regarding boys, the milk below 100 ml and 300 - 400 ml was consumed by more boys in upper middle class family than in lower middle class family. Conversely, milk between 100-200 ml and 200-300 ml was consumed by more respondent in lower middle class family than those in upper middle class family.

In the 15-18 years age group, the milk below 100ml and 100-200 ml was taken by more girls in upper middle class family than in lower middle class family. The milk between 200-300 ml was consumed by more girls in lower middle class family than those in upper middle class family. The intake of milk between 300-400ml was seen in respondents of upper middle class family. In the boys, milk between 100-200 ml was consumed by more boys in lower middle class family than in upper middle class family. Conversely, milk between 200-300

[180]

ml was consumed by more boys in upper middle class family than in lower middle class family .

Average daily intake of nutrients for obese respondents of upper middle & lower middle class

Respondents of upper middle class below 7 years age group consumed more calories and Protein than the R.D.A. , while the fat consumption was lower in respondents of lower middle class than the R.D.A.

In 7-9 years age group, the calories intake was less in upper class girls and more in middle class than the R.D.A. Contrary to it intake of protein was higher in upper middle class and lower in lower middle class than the R.D.A. However the intake of Fat was lower in both the classes. While in boys of both classes intake of calories was lower than the R.D.A. Consumption of protein was more in lower middle class and lower in upper middle class than the R.D.A. Fat intake in the bore the groups was lower and than the R.D.A.

Consumption of calories in girl respondents of 9-12 years age group of both classes was higher than the R.D.A. While protein and fat intake was lower in both groups. In boys calories intake was lower in both groups than the R.D.A. Protein and fat intake of , while intake of these nutrients in lower middle was at far with the R.D.A.

Calories and fat consumption in girls of 12-15 years age group , was more but protein was less than R.D.A. Inversely boys of both groups consumed less energy, protein and fat. than the R.D.A..

[181]

Intake of calories and protein was less in both classes while that of fat was more in girls of 15-18 years age group. Similar trend in the intake of calories protein and fat was observed in boys of lower middle class.

Prevalence of obesity in respondents based on independent variables

In upper middle class family, business affects more the prevalence of obesity followed by agriculture and service, while in lower middle class family, prevalence rate was more in business followed by service. Regarding physical activity majority of respondents of upper middle class family who were not engaged in physical activity showed more obese nature. Similar trend was found in respondents of lower middle class family. Concerning type of family, joint family affects more the prevalence of obesity in upper middle class family. Trend was similar in lower middle class family. Food advertisement showed more effect on prevalence of obesity in both upper middle and lower middle class families. Extra meal showed more effect in upper middle class family.

Prevalence rate of obesity in respondents of Jhansi city

Prevalence of obesity was more in respondents of 7-9 years followed by 9-12 years.

Prevalence rate of obesity in children of upper middle and lower middle class

Prevalence of obesity in respondents of age group below 7 years was found only in upper middle class family. In 7-9 years age group,

[182]

the prevalence rate was more in respondents of upper middle class family than in lower middle class family. Similar trend was found in 9-12 years, 12-15 years and 15-18 years age group.

Prevalence rate of obesity in girls of both group

Prevalence of obesity in respondents of below 7 years and 12-15 years age group was found only in upper middle class family. In the 7-9 years age group, prevalence rate was more in upper middle class than in lower middle class family . Similar trend was seen in 9-12 years and 15-18 years age group, while in 12-15 years age group, prevalence rate of obesity was found in respondents of lower middle class family.

Prevalence rate of obesity in boys of both groups

Prevalence rate was negligible in respondents of below 7 years age group of both class families. Concerning 7-9 years age group, prevalence rate was more in upper middle class than in lower middle class family. Similar trend was found in 9-12 years and 12-15 years age group, while in the 15-18 years age group, prevalence of obesity was seen only in lower middle class family.

Comparison of anthropometric measurements of obese and non-obese children

Height – Boys showed non-significant difference between obese and non-obese respondents. Girls showed non-significant difference between obese and non-obese respondents.

Weight – Boys showed significant difference between obese and non obese respondents. Girls showed significant difference between obese and non-obese respondents.

Mid upper arm circumference (M.U.A.C.)- Boys showed significant difference between obese and non-obese respondents but girls showed non –significant difference between obese and non-obese respondents.

Triceps skin fold thickness (S.F.T.) – Boys showed significant difference between obese and non-obese respondents.

Association between age and obesity

The association between the age and obesity reveals that, age of respondents of both sexes has no association with the prevalence of obesity.

Co-relation between food stuffs (dietary nutrients) intake and weight of respondents

Pulses, green leafy vegetable and fruits intake showed non - significance co-relation with weight gain of respondents. However the intake of energy. Protein and fat exhibited positive co-relation with weight gain. Fat intake had a significant positive co-relation ($r = 0.35$) with weight of respondents. However intake of milk and other vegetables showed a very poor positive co-relation with weight.

Association between independent variables and extent of obesity

The association determined based on the chi-square test reveals that occupation , Physical activity, type of family , encouraged by food advertisement and extra meal were associated with prevalence of obesity in respondents of both class families.

The conclusion of the present study similarise with an over view given by American Obesity Association (2004)

Location or Type of Activity	Effect of Modernization	Impact on Obesity
Transportation	Rise in car ownership Increase in driving shorter distances	Decrease in walking or cycling
At Home	Increase in the use of modern appliances (e.g. microwaves, dishwashers, washing machines, vaccum cleaners) Increase in ready-made foods and ingredients for cooking Increase in television viewing and computer and video game use.	Decrease in manual labor. Increase in consumption of convenience foods that contribute to obesity. Decrease in time spent on more active recreational pursuit
In the Work Place	Increase in sedentary occupational lifestyles due to technology - increase in computerization.	Decrease in physically demanding manual labor.

[185]

Public Places	Increase in the use of elevators , escalators and automatic doors.	Decrease in daily physical activity patterns such as climbing stairs
Urban Residency	Increase in crime in urban areas	Prevents women, children and elderly from going out alone for exercise and leisure activities.

SUGGESTIONS

- Overall energy intake should be restricted to levels commensurate to the sedentary occupations of the affluent, so that obesity is avoided.

- Highly refined and polished cereals should be avoided in preference to undermilled cereals.

- Edible fat intake need not exceed 40 gm and total fat intake should be limited to levels at which fat will provide no more than 20 percent of the total energy.

- The intake of sugar and sweets should be restricted.

- Parent and caregivers should be encouraged to promote healthy eating patterns by offering nutritious snack, such as vegetables and fruits, low-fat dairy foods, and whole grains; encouraging children's autonomy in self-regulation of food intake and setting appropriate limits on choices; and modeling healthy food choices.

- Physical activity, including unstructured play at home, in school, in childcare settings, and throughout the community should be promoted.

- Children should be recommended for the limitation of television and video time to maximum of 2 hours per day, and restriction of in-between food munching .

[187]

- Parents, teachers, coaches and others, who influence youth should be helped to discuss health habits, not body build, as part of their efforts to control overweight and obesity.

- Organizations that are responsible for health care should be encouraged to finance to provide coverage for effective obesity prevention and treatment strategies.

- Public and private sources should be encouraged to direct funding toward research into effective strategies to prevent overweight and obesity and maximize limited family and community resources to achieve healthful outcomes for youth.

- Social marketing should be supported and advocated to promote healthful food choices and increased physical activity.

- Community council should have statutory powers to license fast food vendors who target their sales towards school children.

- The media and food industry should have enormous responsibility. The fashion industries should have a responsibility for promoting beauty as something other than thinness. The food industries should have a responsibility for promoting foods which can contribute to a better dietary intake.

- Schools have a great potential. Nutrition and health issues should be incorporated into the curriculum from an early stage, with boys learning just as much about food, its values and preparation, as girls.

Chapter - 6

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Chapter - 7

Annexure

Annexure - I

1. Name of Child -

2. Sex -   Male ( )   Female (   )

3. Age -

4. Class

5. Religion   -   Hindu / Muslim / Sikh / Christian

6. Type of family- nuclear / joint -

7. Mother's education   -   Nil/Primary School/ High School /

   Intermediate / Graduation / P.G.

   Specialized

8. Father's education -

9. Occupation of father - business / service / any other / agriculture

10. Total family income / month -

11. Anthropometrics measurement -

    Skin Fold Thickness (mm)   M.U.A.C. (cm)

    Height (m)   Weight (kg)

12. Food habits - Vegetarians / Non Vegetarians / Eggegetarians

    Non vegetarians (Occasionally)

13. Do you consume food from canteen or outside during break ?
    Yes/No

If Yes,

Fried (Pakora, Samoa etc.)

Baked (Paties, Pastry etc.)

Beverages (Cold Drinks etc.)

Any other / None

14. Which food group do you prefer during your meal

   Cereals, Pulses & legumes, fruit & vegetables, milk products, fat & sugars

15. Pocket money spend on different items -

16. How often do you go out to eat / frequency of junk food

17. Do you take any precautionary measure regarding your weight -

   medicine / Jim / Walking / Cycling

18. Physical activities -   Games - Indoor / Out door   Hours -

   Exercise - Daily / Weekly / Occasionally   Hours -

19. Watching T.V.   Yes/ No   Hours

20. Are you interested in advertisement ?   Yes / No.

21. Reasons for showing interest in advertisements -

   To know about new product / For entertainment / any other

22. What type of advertisements influence you most ?

   T.V. advertisements

   Radio advertisements

   Friends / Relatives / Neighbors

[II]

Any other

23. Do advertisements of various food products encourage you to buy them ?

Always / Sometimes / Never

24. Do you bring products after being influenced by advertisements ? Yes / No.

Good Quality / Free gifts / Imitation / Discounts / Any other

25. What type of food products do you buy after being influenced by advertisement ?

Breakfast cereals / Ice Cream, butter , cheese etc. / Toffees and chocolates / Jam , Sauce etc. / Soft drinks / Health drinks / Cakes and biscuits / Chips and Crisps.

26. Do you know the cause of obesity (   ) ? Yes/ No.   If yes

Ice Cream, butter , cheese etc. / Toffees and chocolates / Jam , Sauce etc. / Soft drinks / Health drinks Cakes and biscuits / Chips and Crisps / Low activity / Others.

[III]

QUESTIONNAIRE 24 HOURS RECALL

Meal	Item	Number	Gram/Qty.
Breakfast	Chapati		
	Parantha		
	Bread		
	Rice		
	Dal		
	Vegetable		
	Milk		
	Tea		
	Sugar		
	Fruit		
	Other		
Mild morning			
Lunch	Chapati		
	Parantha		
	Rice		
	Dal		
	Vegetable		

[IV]

	Curd Fruit Salad Other		
Evening Tea			
Dinner	Chapati Parantha Rice Dal Vegetable Curd Fruit Salad Other		

Annexure IIA

Average daily Consumption of different nutrients & food stuffs

Age (Years)		R.D.A	Actual Intake (gm)			
			Upper Middle Class			
			Under Weight	Normal Weight	Over Weight	Obese
Calories (Kcal.)						
Below 7	G	1690	1254	1325.75	1531.67	1805
	B	1690		1400	1755	-
7 - 9	G	1950	1302.5	1524.8	1712.5	1692
	B	1950	1600	1626.38	1169	1894
10 - 12	G	1970	1386	1759.36	132.51	1978
	B	2190	1577.5	1686.56	1880.2	1906
13 - 15	G	2060	1472.5	1841.15	1901.1	2235
	B	2450	1832	2039.89	2274.5	2343
16 - 18	G	2060	1521.67	1849.08	1890	2045.5
	B	2640		2354.23	2357.5	-
Protein (gm)						
Below 7	G	30	25	23.18	28.33	38
	B	30		24.67	28	-
7 - 9	G	41	22	33.93	35.5	45
	B	41	35	38.83	44	32

10 - 12	G	57	39.6	39.27	48.43	49.67
	B	54	30	43.6	39.33	45.5
13 - 15	G	65	43.17	44.85	58.3	59
	B	70	43	53.36	56.1	56.75
16 - 18	G	63	37.67	47.04	55.9	56.5
	B	78	-	61.76	63.5	-

Fat (gm)

Below 7	G	25	18	14.75	19.33	23
	B	25	-	19.66	18	-
7 - 9	G	25	13	15.2	21.5	22.33
	B	25	14	14.5	21.6	18.5
10 - 12	G	22	13.5	16.68	19.2	21.67
	B	22	18	16.95	18.3	18
13 - 15	G	22	18.5	17.05	22.0	27
	B	22	13.4	16.25	17.68	20.25
16 - 18	G	22	16	17.5	26.4	23.5
	B	22	-	16.38	22.5	-

Cereals (gm)

Below 7	G	200	155	161.75	225	220
	B	200	-	170.6	150	-
7 - 9	G	250	203	232.5	220	220
	B	250	274	167.72	287	290
10 - 12	G	320	233.6	278.5	289.3	247

	B	320	273	282.39	335	319.5
13 - 15	G	350	261.17	348.9	347.07	372
	B	430	342.6	422.94	445.43	383.75
16 - 18	G	350	276.3	325.62	328.6	33.5
	B	450	-	430.46	460	-

Pulses (gm)

Below 7	G	60	31	33	31.67	43
	B	60	-	36.3	18	-
7 - 9	G	70	31.5	49	20	35
	B	70	31	40.5	31.6	32.5
10 - 12	G	70	38	39.81	45.85	38.67
	B	70	36	52.04	27.17	39
13 - 15	G	70	38.67	52.4	39.15	53
	B	70	31.6	52.19	45.25	49.25
16 - 18	G	70	39.67	54.41	41.77	51
	B	70	-	47.3	47.5	-

Green leafy Vegetable (gm)

Below 7	G	75	45	63.62	56.67	22
	B	75	-	47	45	-
7 - 9	G	75	41	34.33	37.5	23.66
	B	75	64	30.66	62	44
10 - 12	G	100	61	42.2	61.42	38.67
	B	100	51	56.6	41.67	81.5

13 - 15	G	150	64.5	74.55	83.54	-
	B	100	47	42.94	57.81	57.5
16 - 18	G	150	55.33	76.12	43.44	65
	B	100	-	59.23	52.5	-

Roots & Other Vegetable (gm)

Below 7	G	50	55	56.75	45	52
	B	50	-	89	38	-
7 - 9	G	75	46.5	68	38.5	63
	B	75	60	78.94	57.4	65.5
10 - 12	G	75	43	70.45	74.57	67.33
	B	75	66.5	57.1	49.5	81.5
13 - 15	G	75	70.33	64.65	85.46	64
	B	75	61.8	77.9	61.37	77.75
16 - 18	G	75	57	61.27	73.67	85
	B	75	-	73.3	58	-

Fruits (gm)

Below 7	G	50	105	94.25	98.33	56
	B	50	-	131.67	110	-
7 - 9	G	50	132.5	126	83.5	120.33
	B	50	155	121.56	91.6	120
10 - 12	G	50	122	138.18	104	108.66
	B	50	140	145.86	131.33	116
13 - 15	G	30	130.8	149.75	164.2	160

	B	30	133	164.7	179.1	166.75
16 - 18	G	30	131.67	165.4	138.9	172.5
	B	30	-	130.69	140	-
Milk & Milk Products (gm)						
Below 7	G	250	115	153.12	116.67	210
	B	250	-	170	80	-
7 - 9	G	250	120	128	152.5	171.67
	B	250	140	170.39	144	108.5
10 - 12	G	250	167	166.13	140.7	201.67
	B	250	172.05	180.43	184.2	247
13 - 15	G	250	141.67	148.6	117.3	-
	B	250	85.8	189	153	201.5
16 - 18	G	250	148.33	163.5	116.9	215
	B	250	-	162.3	230	-

[X]

Annexure IIB

Age (Years)		R.D.A	Actual Intake (gm)			
			lower middle class			
			Under Weight	Normal Weight	Over Weight	Obese
Calories (Kcal.)						
Below 7	G	1690	-	1446.75	1300	-
	B	1690	1245	1402.28	1237.5	-
7 - 9	G	1950	1325	1671.6	1590	2015
	B	1950	1376.67	1604.5	1604.7	1876
10 - 12	G	1970	-	1605.54	1718.6	2042.5
	B	2190	1645	1724.25	1860.2	2071.5
13 - 15	G	2060	1381.25	1715.6	1840.3	-
	B	2450	2013.3	1937	2139.8	2313
16 - 18	G	2060	1325	1760.66	2065.2	1943
	B	2640	2050	2296.58	2212.3	2370
Protein (gm)						
Below 7	G	30	-	26.37	35	-
	B	30	25	27.42	31.5	-
7 - 9	G	41	35	33.93	36.7	35.5
	B	41	28.67	35.41	42	42
10 - 12	G	57	-	43.32	48	47.5
	B	54	40	46.14	49.5	53.5

[XI]

13 - 15	G	65	40.5	56.32	57.3	-
	B	70	47.33	45.82	49.5	42
16 - 18	G	63	55.5	53.45	54.25	61
	B	78	60	58.6	66	63

Fat (gm)

Below 7	G	25	-	15.56	18	-
	B	25	18	17.21	17	-
7 - 9	G	25	12	16.27	21.6	18.5
	B	25	17.67	14.25	19	19
10 - 12	G	22	-	16.41	20.6	21
	B	22	8	16.51	17.5	23
13 - 15	G	22	13.25	17.8	22.2	-
	B	22	16.33	14.84	22	18
16 - 18	G	22	13	14.5	18.25	26
	B	22	19	15.01	16.0	29

Cereals (gm)

Below 7	G	200	-	203.62	285	-
	B	200	150	259.85	275	-
7 - 9	G	250	160	245.41	282.1	288
	B	250	181.67	258.42	291.7	315
10 - 12	G	320	-	307.9	371	394
	B	320	250	317.21	349	419
13 - 15	G	350	290	327.42	344.6	-

[XII]

	B	430	270	390.33	444.3	502
16 - 18	G	350	215	359.33	405	410
	B	450	310	429.87	465	430

Pulses (gm)

Below 7	G	60	-	41	35	-
	B	60	35	39.25	36.5	-
7 - 9	G	70	18	44.22	30.8	28.5
	B	70	33.67	43.57	38.7	42
10 - 12	G	70	-	47.95	38.6	46
	B	70	3.5	51.1	36	42.5
13 - 15	G	70	42.5	48.72	51.6	-
	B	70	42	50.04	50.4	35
16 - 18	G	70	50.5	48.21	44	33
	B	70	38	54	60.7	46

Green leafy Vegetable (gm)

Below 7	G	75	-	38.5	-	
	B	75	65	41	43	
7 - 9	G	75	45	40.54	47.6	29
	B	75	45	58.78	48.3	60
10 - 12	G	100	-	74.13	37.4	83.5
	B	100	45	50.21	46.75	68.5
13 - 15	G	150	53	69.06	36.3	-
	B	100	63.33	65.41	39.6	70

16 - 18	G	150	65	6.33	35.5	155
	B	100	45	35.25	41.7	125

Roots & Other Vegetable (gm)

Below 7	G	50	-	64.62	55	-
	B	50	35	62.42	70	-
7 - 9	G	75	40	55.37	75.4	59
	B	75	51.67	64.78	76.7	60
10 - 12	G	75	-	64.68	80.6	73
	B	75	38	76.92	78.2	96
13 - 15	G	75	69.5	73.81	84.4	-
	B	75	55	70.55	64.5	69
16 - 18	G	75	82.5	75.25	65.25	100
	B	75	60	73.58	79.3	95

Fruits (gm)

Below 7	G	50	-	113.5	54	-
	B	50	75	104.85	90	-
7 - 9	G	50	70	121.12	105.6	96
	B	50	98.33	121.07	145	140
10 - 12	G	50	-	140.5	123	164
	B	50	140	140.17	149.5	178.5
13 - 15	G	30	97	143.33	111.5	-
	B	30	133.33	148.18	134.3	148
16 - 18	G	30	85	123.75	146	163

Age	Gender	R.D.A.				
	B	30	125	153.58	138.3	180

Milk & Milk Products (gm)

Age	Gender	R.D.A.				
Below 7	G	250	-	120.62	155	-
	B	250	125	165.71	217.5	-
7 - 9	G	250	135	146.66	190.7	207.5
	B	250	113.3	161.07	111.7	0
10 - 12	G	250	-	124.77	163	230
	B	250	140	164.21	216.2	262.5
13 - 15	G	250	121.25	180.39	154.5	-
	B	250	130.67	203.11	187.5	210
16 - 18	G	250	100	182.04	176.5	180
	B	250	138	180.79	246.7	225

G= girls

B = boys

R.D.A. = recommended daily allowances

Rice and wheat were the predominant cereals used. While bengal gram, red gram and black gram were amongst the pulses. the main leafy vegetable were spinach fenugreek. Tubers consumed were potatoes, onions and radish. Milk and Milk products were taken in the form of tea/coffee or curd.